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TO EXAMINE THE OBSTACLES TO IMPLEMENTATION OF HIGH TECHNOLOGY BY SMALL BUSINESS

HEARING

BEFORE THE

SUBCOMMITTEE ON
INNOVATION, TECHNOLOGY AND PRODUCTIVITY

OF THE

COMMITTEE ON SMALL BUSINESS
UNITED STATES SENATE

ONE HUNDRED FIRST CONGRESS

FIRST SESSION

ON

TO EXAMINE THE OBSTACLES TO IMPLEMENTATION OF HIGH TECHNOLOGY BY SMALL BUSINESS

DECEMBER 19, 1989

Printed for the use of the Committee on Small Business

U.S. GOVERNMENT PRINTING OFFICE
27-043 WASHINGTON : 1990

For sale by the Superintendent of Documents, Congressional Sales Office
U.S. Government Printing Office, Washington, DC 20402

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HEARING DATE

December 19, 1989:
Morning session 1

TO EXAMINE THE OBSTACLES TO IMPLEMENTATION OF HIGH TECHNOLOGY BY SMALL BUSINESS

TUESDAY, DECEMBER 19, 1989

U.S. Senate,
Subcommittee on Innovation,
Technology and Productivity,
Committee on Small Business,
Grand Rapids, MI.

The Subcommittee met pursuant to notice, at 10 a.m., 2d Floor Meeting Room, Eberhard Center, 301 West Fulton Street, Grand Rapids, MI, Hon. Carl Levin (Chairman of the Subcommittee) presiding.

STATEMENT OF HON. CARL LEVIN, A U.S. SENATOR FROM THE STATE OF MICHIGAN

Senator Levin. Good morning, everybody.

Today's hearing is part of the Small Business Subcommittee's continuing review of issues related to small business competitiveness. This hearing is going to focus on the problems that small businesses have in adopting new and high technology, with particular attention to the problems of obtaining a trained workforce and having access to sufficient capital. Without the ability of small businesses to assimilate and implement innovative technologies, America is going to drop behind in the technology-driven race to the 21st Century. Since nearly 90 percent of all American business establishments are small businesses, and small businesses created 60 percent of all new jobs between 1976 and 1986, competitive small businesses are critical to our future economic well-being.

Education and training are integral to helping small businesses acquire and use technology, but they are expensive in both time and money. Improving and stimulating student interest in science and math education has become a national cause and it should be. Survey after survey suggests that we will face a shortage of scientists and engineers in the near future and we are already falling behind. Even the current workforce is not able to easily use and adopt new technology. One national survey indicated that more than half of all businesses were having difficulty in finding technically skilled personnel. The Local Area Modernization Plan survey done by RTI seems to bear this trend out, suggesting that a significant percentage of Grand Rapids area manufacturers are having some technology adoption problems due to lack of technical skills of the workforce. Experts from the Hudson Institute tell us that there will be a growing mismatch between the job skills required by the market and the job skills in and coming into the labor pool.

We need programs that can make education and training readily available to small businesses and their employees. This morning I visited Creston High School and saw an example of what can be done in this area. Local resources have come together to create a Pilot Tech Prep Program. It's designed to develop academic and technological skills for tomorrow's workforce. We need more programs like the one at Creston High School and one of the questions we are asking today is what the Federal Government can do about that.

Michigan has made great strides in recognizing and responding to the need to have a technologically literate workforce, assisting businesses and communities through direct funding, outreach, and other methods. According to a 1989 report by the Michigan Job Training Coordinating Council, 70 different Federal and State employment training and adult education programs spent roughly $800 million a year in Michigan. We need to do more, and the hearing today should give us some ideas on what to do.

In addition to a skilled workforce, small businesses also need the capital to adopt new technologies. According to the 1989 Arthur Andersen Enterprise Survey, nearly 70 percent of America's small businesses are financing their operations through a short term line of credit. At high interest rates, this leaves little or no available retained earnings to be reinvested in new technologies to make a business more efficient and competitive. In startling contrast, Japanese small businesses, according to the Office of Technology Assessment (OTA), have readily available guaranteed loans at a 5 percent annual rate of interest that can be rolled over indefinitely. OTA estimates that the Japanese government makes available over $35 billion worth of loans and technical extension services to small businesses every year. All American governmental sources directed to small businesses for technology adoption and technical development may amount to a scant $1 billion. Just think about that. That's a country with one-third, perhaps, the population that we do, smaller GNP still than we do, significantly. Yet the Japanese government invests $35 billion in small businesses for technology adoption, technical development, compared to our $1 billion. There are a lot of statistics which reflect the problems we now have. That's about as good a one as any, I think. The Small Business Administration makes or guarantees approximately $50 million in loans annually.

There are more than 30 Federal programs which seek to stimulate the transfer, the adoption, or improve the efficiency of technology through direct technical assistance, grants, or other mechanisms. The Small Business Innovation Research Program (SBIR), is unique in providing awards to small businesses that seek to bring a product to market but lack adequate funds for research and development. While funding from SBIR is a significant help to some small businesses, the Small Business High Technology Institute indicates that Michigan small businesses should and could be winning more awards.

Over 200 organizations provide direct assistance to small- and medium-sized businesses but, according to the Center for Policy Research, there is no Federal program dealing specifically with the modernization of small- and medium-sized manufacturers and only 13 such State programs. Michigan Modernization Service is one of those 13. The director of the Michigan Modernization Service will be testifying today.

In addition, an OTA report which should be released shortly entitled, "Technology, Innovation, and U.S. Trade," indicates that technology extension services, akin to the Agricultural Cooperative Extension Service model, will be necessary to solve the technology adoption problems of small- and medium-sized businesses. This is a concept on which I hope some of our witnesses will comment.

We as a Nation face a tremendous challenge. States such as Michigan need to continue to diversify our economic base. The only way to do that is to continue to modernize our workforce and our small businesses. Constantly evolving technology is a fact of today's and tomorrow's economy.

In the course of this hearing we are going to hear from the people directly involved in the improvement and preparation of a technically adept Michigan workforce, in the provision of technology extension services, and, perhaps most importantly, small business representatives who have experience with human resource development and with obtaining capital for investments in new or high technology.

This testimony will assist Congress in determining how best to ensure that the Nation's small business sector keeps or exceeds the pace of technological innovation and stays competitive.

What we will do after today's hearing is take what we have learned and other information from other sources and wrap that into the legislative process. We in the Small Business Committee authorize the Small Business Administration's budget, and I believe that we, as you can tell from my opening statement, must focus to a larger extent on the needs of small business, both for a more educated workforce for new technologies and for capital to invest in new technologies. It is the purpose of the Small Business Committee to assist small businesses. It's the purpose of my Subcommittee to see if we can't stimulate innovation, technology, and productivity in small businesses in the United States.

With that introduction let me call on our first panel. Dr. Bruce Chubb, president of RTI, is with us, and we're grateful for your work as well as your presence, Dr. Chubb, and John Cleveland, Director of Michigan Modernization Service will be our first panel. And if you could step forward, we'd like to hear your testimony. You may summarize your testimony, we will put it entirely in the record, or you may read from it, as you wish.

Dr. Chubb.

STATEMENT OF DR. BRUCE A. CHUBB, PRESIDENT, RESEARCH AND TECHNOLOGY INSTITUTE OF WEST MICHIGAN

Dr. Chubb. Thank you. I'd like to basically summarize my testimony as I go through it and to expedite it I'd like to make use of some 35 millimeter colored visual aids as well.[1]

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[1] Graphs appear in Dr. Chubb's prepared statement.

First, let me say, Senator Levin and other guests, that on behalf of the Research and Technology Institute of West Michigan it's a pleasure to host the Senate Small Business Subcommittee on Innovation, Technology and Productivity here at the Eberhard Center.

The topics of small business innovation, technology, and productivity are key words that drive the engines of the Research and Technology Institute.

My testimony this morning will devote the next few minutes to presenting an executive overview of RTI Programs, results of the Local Area Modernization Plan survey, and how I feel it applies to the discussions today, and additional steps required to be responsive to the needs.

Senator LEVIN. Now we're going to see how your high technology works

Mr. CLEVELAND. The pressure is really terrific.

Dr. CHUBB. The pressure is even greater because I'm still waiting for four slides to come in by Airborne Express this morning, but we will just do without those.

The RTI mission is to develop the research and technology infrastructure necessary to support the existing and future, with the emphasis on existing and future, manufacturing of West Michigan.

The key principles guiding the formulation of RTI include, first, to be responsive to the needs of manufacturers in the 30 most western counties of the lower peninsula.

Second, to serve all manufacturers with special attention to the small firms, especially those firms who have between 1 and 49 employees. It takes special care to work with these firms and RTI is set up to specifically tailor our activities to provide that service.

The third guiding principle is to provide a collaborative forum for balancing public education resources for undergraduate and graduate engineering to best meet the needs of West Michigan industry.

Fourth is to link university research to industry needs. The Grand Rapids metropolitan area has been the largest in North America without an engineering research institution as part of its local community. RTI is created to turn that weakness into a strength.

To guide RTI we have in place a strong Board of Governors with well-balanced representation of the constituents. Members of the RTI board include the presidents of all five participating academic institutions coupled with presidents and CEOs from both small and large manufacturing companies.

A major factor behind the creation of RTI was the report on this region's strengths and weaknesses by the Battelle Research Institute. Its major conclusion stated that, If this area expects to continue to reach a position of economic strength in the 1990s and beyond, a program of university-linked research and education in engineering and the sciences must be forged in the 1980s.

Our regional leaders in education, Government, and business chose to respond to that critical need by forming a task force whose first major recommendation was the creation of RTI. Its stated purpose was to unite business and education and to encourage innovation by emphasizing support to small manufacturing firms.

The importance of RTI's success really strikes me though when I read the quotation from a local executive that was made prior to the creation of RTI. He stated that, I would not consider starting a high technology operation in this region without a university-linked research center and locally offered graduate courses in the sciences and engineering.

Before RTI could be created, that company did move its operations out of West Michigan. Several other companies were also preparing to do the same, including the R&D operations of Lear Siegler Instrument Division, this area's largest aerospace firm.

The creation of RTI has helped those operations to decide to stay in West Michigan.

The ultimate aim of RTI is to apply technology to West Michigan manufacturing operations to ensure continued economic vitality by optimizing the parameters of innovation and productivity.

RTI accomplishes its mission by working in four principle thrust areas. These include spearheading of engineering education in the West Michigan area as provided by the consortium of three universities, Grand Valley, Michigan State, and Western Michigan; carrying out applied R&D with RTI's core staff plus strong university involvement; providing direct technical assistance on the manufacturing floor and in the engineering office; and promotion of increased technology training as offered by Ferris State and Grand Rapids Junior College via the Applied Technology Center.

The technical assistance and technology training thrusts of RTI are very closely coupled with the Michigan Modernization Service. John Cleveland will describe the important role of MMS and how it interfaces with RTI following my testimony.

The strength behind RTI is just not in any one of those particular thrust areas, however, it's in how we interweave these four thrust areas to, in turn, provide the best possible integrated support to meet industrial needs.

We still have a long way to go in RTI's development, but our capabilities are growing to meet the needs.

RTI is providing university-linked research and, through the consortium, the education consistent with the mid-eighties Battelle study.

RTI's industry-experienced researchers are a problem-solving applied research strength that is meeting industry needs.

Core staff leverages the indepth resources of the participating educational institutions.

RTI is working to increase the area manufacturers' awareness of the opportunities for Federal and State funding of innovative research programs and generating support for achieving critical mass in staff and laboratories.

As we will see at the close of my testimony, we definitely could use some Federal assistance in funding of key staff and equipment needs.

In terms of facilities you can think of RTI as one organization in two locations, both in downtown Grand Rapids. First, at the bottom left, is the L.V. Eberhard Center on the GVSU campus, and second, on the right, is the newly being constructed Applied Technology Center on the GRJC campus.

The Eberhard Center is the home of engineering education for all three universities as well as RTI offices and engineering laboratories.

Engineering education programs are being offered through the Consortium for Engineering Education. MSU offers Master's of Science degrees in electrical engineering and computer science. Western offers Master's degrees in mechanical and industrial engineering; and Grand Valley offers the BS in engineering.

The important point is now that all three programs or all three schools are united in their approach, all courses are taught in the Eberhard Center with shared laboratories and shared facilities and all provide full resident programs at this location.

The 1987-88 graduate class enrollment totaled 106. During 1988-89 enrollments increased to 178. Enrollments this fall indicate another additional 67 percent increase. The undergraduate program is now over 200 students and growing rapidly.

The Applied Technology Center is the home for technology training and a substantial part of the technical assistance. This facility is now under construction with scheduled opening in November 1990.

Specialty areas of instructions include computer-aided design and drafting, automated manufacturing, plastics manufacturing technology, computer applications, electronics, and energy management.

The current focused areas of RTI applied research include computer integrated/flexible manufacturing, CIM for plastic products, software engineering, optoelectronics-electronics and systems, vehicle systems, and environmental quality, including work in industrial waste systems, materials, and chemical processing.

In its first 2 years RTI has established a proven track record by receiving significant research and technology funded projects. For example, under a State grant we have six project areas funded for a total amount of $761,000. Through November we've received 26 private sector projects for a value of $294,000.

We have also received two Federal programs. Although small, they represent a start at bringing more Federal R&D dollars to West Michigan. Assistance to help us obtain further Federal funding is extremely important to further our ability to meet area business needs.

This brings me to my next first-missing slide which shows we should now focus on the Michigan Modernization Survey of the Local Area Modernization Plan.

Senator LEVIN. Here is what we call a stealthy slide in the armed services.

Dr. CHUBB. Stealth slide.

It is these results that are driving our response to meet industry needs.

The Local Area Modernization Plan or LAMP survey has two main purposes, to understand the composition and needs of manufacturers in the country, in the county and throughout West Michigan, including the opportunities for improving business performance as well as the threats that impair business performance, and, two, to enable improved service delivery, primarily to the small-

and medium-sized manufacturers that make up 90, 95 percent of the manufacturing base in West Michigan.

RTI sponsored the local survey, performed the analysis, the draft report, and prepared the final executive overview report that is available as a handout today. The survey itself was conducted under contract by Michigan Modernization Service and covered 388 manufacturers employing 10 or more persons. From that base 248 firms, employing some 38,000 people, supplied data during an extensive telephone interview. To complete the survey, 127 of those firms also completed a very detailed written questionnaire.

The survey did confirm that the area has good diversity in manufacturing employment. No one sector dominates. The furniture industry plays a major role, but still represents only 18 percent of the local employment. The fabricated metals manufacturers have a slight edge in total employment, due in part to their large number of medium- and small-sized manufacturers supplying parts to major markets such as the automotive industry.

Productivity growth has been quite strong. In the recent past industries were able to increase sales, the red bar, while growing employment, the green bar, more slowly than sales.

We can say, in general, that industries improved their productivity during this period since they generated more sales per employee at the end of the period compared to the beginning of the period.

Plastics was the only sector in which employment grew more rapidly than sales.

Overall, sales increased 35 percent faster than employment, which represents a healthy growth in productivity.

An important indicator of manufacturers' commitment to productivity is the rate at which firms put new computer controlled equipment on the shop floor.

Survey results compare the degree to which responding companies had adopted computer controlled equipment at two points in time, 1983 and 1988.

The figures at the top of the green bar show that the compounded growth rates from 1983 to 1988 range between 11 and 48 percent. The four right-most industries show the greatest current usage, while the two left-most industries grew at the fastest rate, albeit from a small base. Overall, manufacturers put additional computer controlled equipment to work at a rate of 27 percent per year over the last 5 years.

Combining the sales versus employment data with the rate of technology adoption helps answer the always-posed question, "Does a high rate of introducing technology, that is, computer controlled equipment, lead to improved productivity?" The survey data supports that it does.

Along the X-axis are the compound growth numbers we just looked at. Along the Y-axis are the rates of sales growth to employment growth. Note the concentration of dots toward the upper right center of this diagram, and the general trend line that one could draw through them from lower left to upper right. Clearly the upper right quadrant is the place to be, greater technology investment correlates with improved productivity.

The size of the circles is proportional to the employment base of each industry sector. Fabricated metals and furniture are the two big employers, representing some 38 percent of employment. The data shows that these two and the other major West Michigan industrial sectors have performed quite well over the survey period in realizing improved productivity. What we need to do is to concentrate and make this trend continue.

Manufacturers reported widespread current use and planned future use of new technologies. The major technologies reported in terms of the percentage of respondents who said they were using the technology includes computer-aided design, production planning software, computer numerical control, and programmable controllers.

A disturbing corollary, though, is that some 40 percent of respondents said that they do not use any computer controlled equipment in their manufacturing floor.

With competitive pressure, both here and abroad, forcing most manufacturing industries to adopt the new technologies, these firms that are too slow to adopt may find themselves in the jaws of declining sales at a time when they need to invest heavily in new technology.

Surveys of industry show a strong need for assistance in implementing technologies. Desired attempts to use advanced technologies in manufacturing is growing at the 30 percent annual rate. The problem is that 57 percent of the users reported problems in implementing the advanced technologies, mostly due to lack of worker and technical staff understanding. However, after the problems were solved, 86 percent were satisfied that the new technologies were improving the bottom line operation of the company.

Specifically, the problems were greatest in lack of worker skills in operating new systems, lack of technical staff understanding, lack of quality technical documentation from vendors, and insufficient worker skills in repairing equipment.

Additional survey findings in workforce development show that personnel shortages in a number of specialties are very acute in this area, as confirmed by the 36 percent of firms reporting shortages, highest of all the LAMP areas surveyed today. Nearly half of the manufacturers are conducting formal training programs, 71 percent of respondents send employees off-site for additional training.

However, it's very disappointing to see that over 75 percent of the area manufacturers spend less than 5 percent of their operating budget on training. On the other hand, 10 percent spend 10 percent or more of their operating budget on training.

Overall, if we reflect on the need for additional technology and the shortage of adequately trained workers and technical staff, I believe we'll see an increase in the training budgets gradually across the board. Certainly, added national attention to improved education and increased funding for sciences and engineering is of key importance.

Manufacturers reported specific needs for technology training in areas such as workforce development, CAD, MRP, software, and automated inspection. Having available better prepared candidates for entry-level technical positions was extremely important. Alleviating unusually high rates of personnel shortages, especially in the technical areas, was key.

Manufacturers reported need for R & D help in areas such as handling the high rate of implementing new technologies, securing outside technology funding support for innovative new products aimed at new markets, and addressing advanced technology problems that require skills beyond the capabilities of in-house staff.

RTI is helping. RTI is providing university-linked research and, through the consortium, the engineering education. RTI's industry-experienced researchers bring applied problem-solving research strength to manufacturers' problems and leverage into the in-depth resources of the five participating educational institutions.

Another way RTI is helping is by conducting seminars on the opportunities for Federal and State funding of innovative research through SBIR Programs, providing advanced capabilities in electro-optical operative systems and software engineering, augmenting inhouse capabilities. Finally, RTI is in the process of generating additional support for achieving critical mass in its R & D staff and laboratories

I'd like to change our focus now to the additional steps required to be responsive to needs.

The historical and projected RTI revenue in the 7-year period 1987 through 1993, totals $18 million.

There are four major segments essential to solidify the RTI mission. The 32 percent, shown in green, from the Michigan Strategic Fund Grant is already in place. Regarding the $1.7 million initial seed funding, in gray, all but 7 percent of that will be expended by the end of calendar year 1989, which is only a few days away. Our next major component is the $6 million in additional funds needed from private sectors and, hopefully, some Federal funding. This area shown in yellow is to provide 33 percent of the required revenue base.

With these in place RTI will have achieved a critical mass and be able to obtain through our memberships, contracted R & D and technical assistance efforts, a revenue of $4.5 million. These contracted revenues shown by the red area will make up 26 percent of the forecasted income over this startup period.

The lack of Federal funding is all too obvious in this picture and if Federal appropriations could be made to RTI they would substantially increase the technology base to help small businesses in areas of innovation, technology, and productivity.

In many ways what is being accomplished in West Michigan could be a model for the rest of the Nation.

The 5-year $5.8 million grant to RTI covers three—from the State covers three main areas. The dominant portion, 58 percent, provides direct support to industry by the State's Michigan Modernization Service Program that will be covered by John Cleveland. Of the grants, 22 percent is for general operational and facilities funding covering all four thrust areas. Twenty percent covers specific research and technology seed efforts as well as a workforce development program impacting the high schools and community colleges from Benton Harbor to Traverse City.

The additional funding required at the $6 million level covers four main areas. Formation of R & D staff amounts to 38 percent, shown in yellow. Acquisition of laboratory equipment amounts to

37 percent, shown in gray. 17 percent is the general operations covering all thrust areas. Eight percent is facilities improvement.

Basically, the achievement of the $6 million level from foundations, Federal funding, and the private sector is key to building the needed up-front capabilities to make RTI a success for this region.

The largest need is in the formation of the staff, its operational support and special recognition events shown here.

The second need is the acquisition of essential laboratory equipment to support the R & D needs in 14 areas. These laboratories include equipment for the Applied Technology Center, the engineering laboratories in the Eberhard Center, and four additional laboratories at off-site facilities.

In summary, RTI is specifically designed to generate strong economic benefits. These include improvement in the overall skill level of both the technical and engineering workforce, stimulation of job creation and advancement opportunities, maximizing the utilization of expensive high-tech resources; to provide the essential equipment, beyond the reach of most university or college laboratories, to enhance the engineering, education, and research opportunities supporting industry; and improve the rate and effectiveness of technology implementation by manufacturers.

Industrial support for RTI is strong. For example, Ted Thompson, president of X-Rite Corp., one of the fastest growing small high technology companies in the United States states that, "RTI is working to fill a void that has handicapped this area for years; we are very impressed with RTI's first year accomplishments."

I might point out that since this quote was made by Ted Thompson he has now joined the RTI Board of Governors.

Senator LEVIN. That's the qualification to be on the board?

Dr. CHUBB. Not really, but he just became so enthused he joined up and has been a big supporter of all the activities.

Senator LEVIN. You'd have a very large board if everybody that's saying complimentary things about you these days joined the board, you'd have a board a little too heavy.

Dr. CHUBB. The board right now is 33 people, but it's very effective and doing a good job.

I might add that all the RTI accomplishments are directly in line with Governor Blanchard's statement that, "RTI provides a public/private cooperation to help make Michigan the international center for advanced manufacturing technology."

In summary, West Michigan is one of the most vibrant economic areas in North America.

RTI's role is designed to marshal and strengthen available resources to even better serve local industry.

The results of RTI enhance business retention, expansion, attraction, and creation.

Federal support to help make the RTI dream a reality is very key to strengthening the economy. A successful RTI Program in West Michigan can be a model for the whole United States. Your support, Senator Levin, and the support of your Subcommittee on Innovation, Technology, and Productivity are key to this success. Thank you very much.

[The prepared statement of Dr. Chubb follows:]

INNOVATION, TECHNOLOGY AND PRODUCTIVITY SUBCOMMITTEE OF THE SENATE SMALL BUSINESS COMMITTEE

Senator Carl Levin (D-MI), Chairman

Panel #1 Overview

Results of LAMP Survey, RTI Response

Dr. Bruce A. Chubb, President RTI

Senator Levin, and other guests. On behalf of the Research and Technology Institute of West Michigan it is a pleasure to host the Senate Small Business Sub-Committee on Innovation, Technology and Productivity.

The topics of small business, innovation, technology and productivity are key words that drive the engines of the Research and Technology Institute.

My testimony this morning will devote the next few minutes to

- an executive overview of RTI programs,
- results of the Local Area Modernization Plan survey, and
- additional steps required to be responsive to needs.

OVERVIEW OF RTI PROGRAMS

The RTI mission is to develop the research and technology infrastructure necessary to support the existing and future manufacturing of west Michigan.

The key principles guiding the formation of RTI include:

- First, to meet the needs of manufacturers in the 30 most western counties of the lower peninsula.
- Serve all manufacturers, with special attention to the small firms, especially those firms who have between 1 and 49 employees. It takes special care to work with the innovative new firms who have 1 to 10 employees. The RTI organization is specifically tailored to provide that service.
- The 3rd guiding principal is to provide the collaborative forum for balancing public education resources for undergraduate and graduate engineering to best meet West Michigan industry needs.

- The 4th principle is to link university research to industry needs. The Grand Rapids metropolitan area has been the largest in North America without a major engineering research institution as part of its local community. RTI is created to turn that weakness into a strength.
- Also of significant importance, to accomplish the four above goals, we have in place a strong Board of Governors with balanced representation of the constituents. Members of the RTI board include the Presidents of the five participating academic institutions supporting RTI coupled with the Presidents and CEO's from both small and large manufacturing companies.

A major factor behind the creation of RTI was the report on this region's strengths and weaknesses by the Battelle Research Institute. One of the major conclusions of the report was that,

> "If this area expects to continue to reach a position of economic strength in the 1990's and beyond, a program of university linked research and education in engineering and the sciences must be forged in the 1980's."

Our regional leaders in education, government and business chose to respond to this critical need by forming a task force which established as its first major recommendation the creation of the Research & Technology Institute. It's stated purpose was to unite business and education and to encourage innovation by emphasizing support to small manufacturing firms.

The importance of RTI's success really strikes me when I read the quotation from a local executive that was made prior to the creation of RTI. He said:

> "I would not consider starting a high tech operation in this area without a university linked research center and locally offered graduate courses in the sciences and engineering."

Before RTI could be created, that company did move its operations out of west Michigan. Several other companies were also preparing to do the same, including the R&D operations of the Lear Siegler Instrument Division, this area's largest aerospace firm.

The creation of RTI has helped those operations to decide to stay in West Michigan.

The ultimate aim of RTI is to apply technology to West Michigan manufacturing operations to ensure continued economic vitality by optimizing the parameters of innovation and productivity.

RTI accomplishes its mission working in four principle thrust areas that include:

- Spearheading of Engineering Education in the West Michigan area as provided by a Consortium of the 3 universities - Grand Valley State, Michigan State, and Western Michigan.
- Carrying out applied R&D with RTI's core staff plus strong university involvement.
- Providing direct Technical Assistance on the manufacturing floor and in the engineering office, and
- Promotion of increased Technology Training as offered by Ferris State University and Grand Rapids Junior College via the Applied Technology Center.

The technical assistance and technology training thrusts of RTI are also very closely coupled with the Michigan Modernization Service. John Cleveland will describe the important role of MMS, and how it interfaces with RTI, following my testimony.

The strength behind RTI is not just in any one of these particular areas but in the way we are interweaving these four thrust areas to in turn provide the best possible integrated support to meet industrial needs.

We still have a long ways to go in our overall development, but RTI capabilities are growing to meet area needs:

- RTI is providing university-linked research and, through the consortium, education in engineering consistent with the mid-80's Battelle study.
- RTI's industry-experienced researchers are a problem-solving applied research strength to help meet the needs of area industry.
- The core staff leverages the in-depth resources of the participating educational institutions. Current core staff numbers 17, including 14 scientists, engineers and researchers with 7 providing joint faculty/student ties to the Universities.
- RTI is working to increase area manufacturers' awareness of the opportunities for federal and state funding of innovative research, and
- Generating support for achieving critical mass in staff and laboratories. As we will see at the close of my testimony, we definitely could use some federal assistance in funding of key staff and equipment needs.

In terms of facilities, you can think of RTI as one organization in two locations - both in downtown Grand Rapids. The first, at the bottom left, is the L.V. Eberhard Center on the GVSU campus and the second, on the right, is the Applied Technology Center on the GRJC campus.

The Eberhard Center is the home of Engineering Education for all 3 Universities as well as the RTI offices and engineering laboratories.

Engineering Education programs are being offered through the Consortium for Engineering Education. Michigan State offers Masters of Science Degrees in Electrical Engineering and Computer Science. Western Michigan offers Masters degrees in Mechanical and Industrial Engineering. Grand Valley State offers the Bachelor of Science in Engineering. All courses are taught in the Eberhard Center.

The 1987-88 graduate class enrollments totaled 106. During 1988-89, enrollments increased to 178 and enrollments this fall indicate an additional 67% increase. The undergraduate program is over 200 students and growing rapidly.

The Applied Technology Center is the home for Technology Training and a substantial part of the Technical Assistance. The $24 million dollar facility is now under construction with a scheduled opening of November 1990.

Speciality areas of instruction include computer aided design and drafting, automated manufacturing, plastics manufacturing technology computer applications, electronics, and energy management.

The current focused areas of RTI research include computer integrated/flexible manufacturing, CIM for plastic products, software engineering, optoelectronics - electronics and systems, vehicle systems and environmental quality including work in industrial waste systems, materials and chemical processing.

In its first two years, RTI has established a proven track record by receiving significant research and technology funded projects. For example, under a State grant we have six project areas funded for a total amount of $761,000. Through November we have received 26 private sector projects for a value of $293,551.

We have also received two Federal programs. Although small, they represent a start at bringing more Federal R&D dollars to West Michigan. Assistance to help us obtain further federal funding is extremely important to further our ability to meet area business needs.

RESULTS OF LOCAL AREA MODERNIZATION SURVEY

Let me turn now to our next topic - the results of the Local Area Modernization Plan survey, for it is these results that are driving our response to meet industry needs.

The Local Area Modernization Plan or LAMP survey has 2 main purposes:

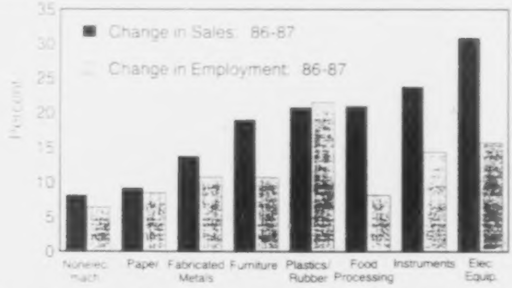
- To understand the composition and needs of manufacturers in the County and throughout West Michigan, including the opportunities for improving business performance as well as the threats that impair business performance, and
- To enable improved service delivery -- primarily to the small and medium sized manufacturers that make up 95% of the manufacturing base in West Michigan.

RTI sponsored the local survey, performed the analysis of the draft report, and prepared the final Executive Overview report. The survey itself was conducted under contract by the Michigan Modernization Service and covered 388 manufacturers employing 10 or more persons. From that base, 248 firms, employing some 38,000 people, supplied data during an extensive phone interview. To complete the survey, 127 of those firms also completed a detailed written questionnaire.

The survey did confirm that the area has good diversity in manufacturing employment. No one sector dominates. The furniture industry plays a major role, representing 18% of local employment. But the fabricated metals manufacturers have a slight edge in total employment, due in part to the large number of medium and small - sized manufacturers supplying parts to the major markets, such as the automobile industry.

Productivity growth has been quite strong. In the recent past, industries were able to increase sales (the red bar) while growing employment (the green bar) more slowly than sales.

MANUFACTURERS REALIZED GOOD PRODUCTIVITY GROWTH FOR PERIOD 1986-1987



On average, sales increased 35% faster than employment.

432

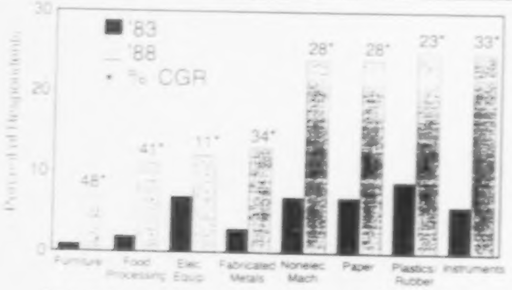
We can say, in general, that industries improved their productivity during this period, since they generated more sales per employee at the end of the period compared to the beginning of the period.

Plastics was the only sector in which employment grew more rapidly than sales.

Overall, sales increased 35% faster than employment, which represents a healthy growth in productivity.

An important indicator of manufacturers' commitment to productivity is the rate at which firms put new computer controlled equipment on the shop floor.

TECHNOLOGY TRENDS IN COMPUTER-BASED MANUFACTURING



On average, area manufacturers are adopting computer controlled equipment at compounded growth rate of 27%.

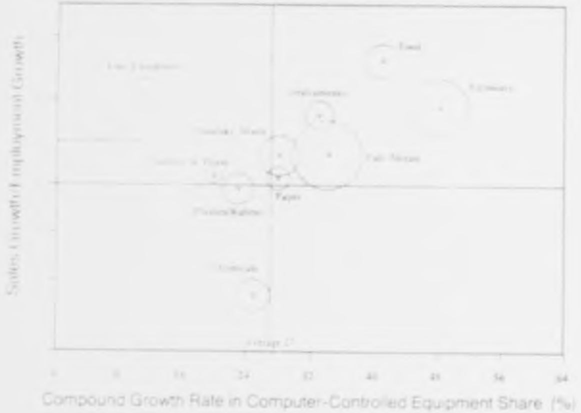
434

Survey results compare the degree to which responding companies had adopted computer controlled equipment at two points in time - 1983 and 1988.

The figures (at the top of the green bar) show that the compound growth rates from 1983 to 1988 range between 11 and 48 percent depending upon the industry sector. The four right-most industries show the greatest current usage, while the two left-most industries grew at the fastest rate, albeit from a small base. Overall, manufacturers put additional computer controlled equipment to work at a rate of 27% per year over the last 5 years.

Combining the sales vs employment data with the rate of technology adoption helps answer the question: Does a high rate of introducing technology, i.e., computer controlled equipment, lead to improved productivity? The survey data shows that it does.

LARGEST INDUSTRIES ARE REALIZING BENEFITS OF TECHNOLOGY INVESTMENT

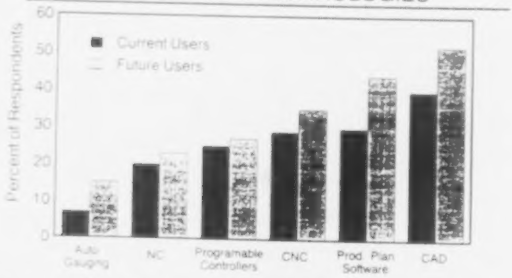


Along the X-axis are the compound growth numbers we just looked at. Along the Y-axis are the rates of sales growth to employment growth. Note the concentration of dots toward the upper right center of this diagram, and the general trend line that one could draw thought them from lower left to upper right. Clearly the upper right quadrant is the place to be - greater technology investment correlates with improved productivity.

The size of the circles is proportionate to the employment base of each industry sector. Fabricated metals and furniture are the 2 big employers - representing some 38% of employment. The data shows that these two and the other major West Michigan industrial sectors have performed well over the survey period in realizing improved productivity.

Manufacturers report widespread current use and planned future use of new technologies. The major technologies reported in terms of the percentage of respondents who said they were using the technology includes computer aided design, production planning software, computer numerical control and programmable controllers.

MANUFACTURERS REPORTED WIDESPREAD CURRENT USE AND PLANNED FUTURE USE OF NEW TECHNOLOGIES



However, 40% of respondents have no computer-controlled equipment.

435

Obviously, manufacturers are using multiple technologies, which explains why the sum of all the individuals bars exceeds 100 percent. The biggest growth is expected in the CNC, production planning software, and CAD technologies.

A disturbing corollary, though, is that some 40% of respondents said they are not using computer controlled equipment. With competitive pressures both here and abroad forcing most manufacturing industries to adopt the new technologies, these firms that are too slow to adopt may find themselves in the jaws of declining sales at a time when they need to invest heavily for new technology.

Surveys of industry show a strong need for assistance in implementing technologies. Desired attempts to use advanced technologies in manufacturing is growing at a 30% annual rate. The problem is that 57% of the users reported problems in implementing the advanced technologies - mostly due to the lack of worker and technical staff understanding. However, after the problems were solved, 86% were satisfied that the new technologies were improving the bottom line operation of the company.

Specifically, the problems were greatest in lack of worker skills in operating new systems, lack of technical staff understanding, lack of quality technical documentation from vendors, and insufficient worker skills in repairing equipment.

Additional survey findings in workforce development show that personnel shortages in a number of specialities are acute, as confirmed by the 36% of firms reporting shortages - highest of all LAMP survey areas. Nearly half of the manufacturers are conducting formal training programs and 71% of the respondents send employees off-site for training.

However, it is very disappointing to see that over 75% of area manufacturers spend less than 5% of their operating budget on training. On the other hand, 10% spend 10% or more of their operating budget on training.

Overall, if we reflect on the need for additional technology, and the shortage of adequately trained workers and technical staff, I believe we'll see training budgets gradually increase across the board. Certainly, added national attention to improve education and increasing funding for the sciences and engineering is of key importance.

Manufacturers reported specific needs for technology training in areas such as:

- Workforce development in CAD, MRP, software and automated inspection,
- Having available better prepared candidates for entry-level technical positions, and help in
- Alleviating unusually high rates of personnel shortages, especially technical personnel

Manufacturers reported needs for R&D help in areas such as:

- Handling the high rate of implementing new technologies in the engineering office and on the shop floor,
- Securing outside technology funding support for innovative new products aimed at new markets, and
- Addressing advanced technology problems that require skills beyond the capabilities of in-house staff.

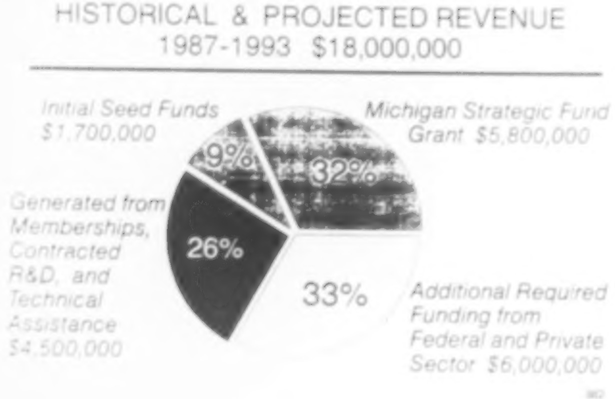
The Research & Technology Institute is helping. RTI provides university-linked research and education in engineering. RTI's industry-experienced researchers bring a problem-solving applied research strength to manufacturers' problems and leverage into the in-depth resources of the five participating educational institutions.

Another way RTI is helping is by conducting seminars on the opportunities for federal and state funding of innovative research through SBIR programs. RTI provides advanced capabilities in electro-optical systems and software engineering, to name two, to augment in-house capabilities. Finally, RTI is in the process of generating additional support for achieving critical mass in its R&D staff and laboratories.

****ADDITIONAL STEPS REQUIRED TO BE RESPONSIVE TO NEED****

This brings us to the last topic in my testimony - additional efforts required to be responsive to needs.

Historical and projected RTI revenue for the 7-year period 1987 through 1993 totals $18 million.


HISTORICAL & PROJECTED REVENUE
1987-1993 $18,000,000

There are four major segments essential to solidify the RTI mission. The 32%, shown in green from the Michigan Strategic Fund grant is already in place. Regarding the initial seed funding of $1.7 million, as shown in gray, all but 7% will be expended by the end of calendar year 1989. Our next major component is the $6 million dollars in additional funding needed from federal and private sources. This area, shown in yellow, is to provide 33% of the required revenue base.

With these in place, RTI will have achieved a critical mass and be able to obtain through our memberships, contracted R&D and technical assistance efforts, a revenue of $4,500,000. These contracted revenues, shown by the red area will make up 26% of the forecasted income over this start-up period.

The lack of federal funding is all too obvious in this picture and if federal appropriations could be made to RTI, they would substantially increase the technology base to help small business in areas of innovation, technology and productivity.

In many ways.... what is being accomplished in West Michigan could be a model for the rest of the nation.

The 5-year $5.8 million dollar State grant to RTI covers three main areas. The dominant portion, 58 percent, provides direct support to industry by the State's Michigan Modernization Service program which will be covered by John Cleveland. Twenty two percent of the grant is for general operational and facilities funding covering all four thrust areas of RTI while 20 percent of the grant covers specific research and technology programs as well as a workforce development program. This latter program supports the improvement of technology training provided by high schools and community colleges from Benton Harbor to Traverse City.

The additional funding requirement at the $6 million dollar level covers four main areas:

- The formation of the R&D staff amounts to 38% as indicated in the yellow area,
- The acquisition of laboratory equipment amounts to 37% of the total as shown in the gray area,
- 17% is for general operations covering all four thrust areas of RTI and ...
- 8% is for facilities improvement and expansion.

Basically, the achievement of the $6 million dollar level from foundations, federal funding and the private sector is key to building the needed up-front capabilities to make RTI a success.

The largest need is the formation of the staff, it's operational support and special recognition events that spearhead the delivery of applied research and development. Specifically, the $2.32 million allocated in this area covers:

- 6 or more joint faculty appointments.
- 3 full-time RTI staff positions.
- Operational support to the R&D staff including funding for a laboratory engineer and technician plus the use of graduate assistants.
- Support of up to 10 RTI Fellow appointments on an annual basis from university/college faculty.
- Support of up to 10 RTI Associate Fellow appointments from high school science and mathematics teachers.
- Up to $5,000 annually in research prizes for graduate and undergraduate student research.

- Up to $2,500 annually in prizes or part time work for outstanding high school students.

The second major need is the acquisition of essential laboratory equipment to support the R&D needs in 14 areas. These laboratory investments at the $2.21 million level are in three major facilities.

First to receive the benefits is the Applied Technology Center in the area of advanced plastics and flexible manufacturing.

The second facility is the Eberhard Center in the areas of automated systems, computer aided software development, computer integration, thermodynamics and fluids laboratory, integrated facilities research, engineering materials laboratory, engineering photographic laboratory and the optoelectronics laboratory.

Also, the equipment funding covers four required off-site program areas including an engineering prototype fabrication laboratory, a design integrity laboratory, an engineering prototype circuit board facility, and new developments in the area of industrial environmental quality, chemicals and materials processing.

In summary, RTI is specifically designed to generate strong economic benefits. These include:

- Improvement in the overall skill level of both the technical and engineering workforce.
- The stimulation of job creation and advancement opportunities.
- Maximizing the utilization of expensive high-tech resources including both staff and equipment.
- Provide the essential equipment, beyond the reach of most university or college laboratories, to enhance the engineering education and research opportunities.
- Improve the rate and effectiveness of technology implementation by manufacturers.

Industrial support for RTI is strong. For example Ted Thompson, President of X-Rite Corporation, one of the fastest growing, small high technology companies in the U.S., states that:

> "RTI is working to fill a void that has handicapped this area for years....we are very impressed with RTI's first year accomplishments."

I might point out that since this quote was made by Ted Thompson, he has now joined the RTI Board of Governors.

All of the RTI accomplishments are directly in line with Governor Blanchard's statement that:

> "RTI provides the public-private cooperation to make Michigan the international center for advanced manufacturing technology."

In summary....West Michigan is one of the most vibrant economic areas in North America.

RTI's role is designed to marshal and strengthen available resources to better serve local industry.

The results of RTI enhance business retention, expansion, attraction, and creation.

Federal support to help make the RTI dream a reality is very key to strengthening the economy. A successful RTI program in West Michigan can be a model for the whole United States. Your support, Senator Levin, and the support of your subcommittee on Innovation, Technology and Productivity are key to this success. Thank you very much.

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Senator LEVIN. Thank you, Dr. Chubb. I appreciate all you're doing, and your being here this morning.

Mr. Cleveland, do you want to take over?

Mr. CLEVELAND. Yes, I do.

Senator LEVIN. Reminds me of the help you gave us a few years back on the Unemployment Benefit Program.

Mr. CLEVELAND. Chris was saying that, he reminded me of the many hours I spent with your staff, Chuck Cutolo.

Senator LEVIN. He's still with us.

Mr. CLEVELAND. He's a great guy. At least for the last couple of years it's not a problem you've had to wrestle with and hope it isn't one in the next couple of years.

Senator LEVIN. We all hope so. The kind of work you're putting forth here in West Michigan at least will reduce the prospects of the high unemployment rate.

Mr. CLEVELAND. Absolutely, absolutely, thank you, Senator.

STATEMENT OF JOHN CLEVELAND, DIRECTOR, MICHIGAN MODERNIZATION SERVICE, MICHIGAN DEPARTMENT OF COMMERCE

Mr. CLEVELAND. My name is John Cleveland. I'm the director of the Michigan Modernization Service and I'm going to go briefly over the testimony that I've provided you with, and there's a summary sheet in the front part of it.

We're a program of the State Department of Commerce and our mission is to increase the productivity of small- and medium-sized manufacturers to increase the skills and incomes of their workers and the competitiveness of the firms to which they provide their goods and services.

As Bruce indicated, our programs are carried out in partnership with the Research and Technology Institute, and particularly the Applied Technology Center in Western Michigan, and also with the Industrial Technology Institute in Ann Arbor.

We provide customized consultation to small- and medium-sized manufacturers in three areas, technology deployment, which involves general improvements in the production process; workforce development, which involves training and education of workers; and also market analysis.

We provide customized individual market analyses to individual firms and help them understand how to carry the marketing function out within their firm.

I should say that MMS evolved out of our experience with two events, one with the 1979 to 1982 recession and a need to strengthen our manufacturing base, and, second, some very detailed analysis we did of the Michigan automotive industry which indicated that the highest comparative advantage for State government investments would probably be in the building of a competitive supply base for that industry, and that's why we, for public policy purposes, are concentrating on these small- and medium-sized firms.

We have worked with over 550 firms representing 55,000 workers and over $7 billion worth of annual sales, about 10 percent of the total small-, medium-sized manufacturing base in the State.

What I'd like to do is briefly share with you what I think are some of the lessons that we've learned over the last few years of mucking around in this relatively new market for the public sector. Let me just go through these point by point.

Point No. 1 is that small firms matter. Some research done by the Industrial Technology Institute indicates that there are 120,000 U.S. manufacturers with 20 to 500 employees. They employ 10.4 million workers and they pay $222 billion in wages and account for 46 percent of the value added in American manufacturing.

In Michigan there are 5,900 such firms that employ 441,000 workers with payroll of $11 billion, which account for about half of our manufacturing economy.

Senator LEVIN. What was the size of that firm you used?

Mr. CLEVELAND. In the range of 20 to 500, Senator. Another interesting point is that the proportion of their value in the economy has increased steadily, regardless of the business cycle. In Michigan in 1979 they represented 37 percent of manufacturing employment. They now represent 44 percent, so they are increasing.

Senator LEVIN. Now meaning 1988 data?

Mr. CLEVELAND. This is 1986. These are statistics from 1986. So regardless of the business cycle they are increasing their representation in the base. That's probably due to a couple of things. One of those is outsourcing from the OEMs. Second is the general growth in small businesses, and third may be part of the strategy to move away from large unionized firms to smaller nonunionized firms in terms of production.

The point is while the focus tends to be on Fortune 500 companies, this part of the base represents about half of our manufacturing economy.

The second point is that small manufacturers lag large manufacturers both in productivity and in technology adoption, and with some notable exceptions, some of whom you'll hear from such as Gene DeFouw of Alofs and Cascade Engineering, as a group this size firm tends to be more technologically backward and lower in productivity than larger firms, and I would refer you, Senator, to a couple of the—the three attachments, four attachments to this testimony in the back which show that productivity is lower, hourly wages are lower, the rate of unionization is lower.

If you look at the second chart also you will see that the technology adoption rate decreases as you get down to smaller firms and in some instances for smaller firms is 50 percent of what it is for larger firms.

That alphabet soup on the lefthand column is some of the typical computer control technology: Production planning and inventory controls, statistical process control, computer numerical control, programable logic controllers, and computer-aided design.

The point is that the smaller firms consistently have lower rates of adoption than larger firms and if you will go to the next chart you will see——

Senator LEVIN. Before you leave that chart——

Mr. CLEVELAND. Certainly.

Senator LEVIN. Do you see any change in that over time?

Mr. CLEVELAND. We have—if you will look at the chart, we have seen that there is—they are both increasing, the rates are both increasing, but the differences between small firms and large firms is staying relatively the same. They are both going up.

Senator **Levin**. The gap remains.

Mr. **Cleveland**. The gap remains, and, in fact, if you will look at the next chart, relatively disturbing is the fact that the gap in productivity and earnings is increasing rather than decreasing. If you see the dark line is productivity, the dotted is earnings. These are productivity and earnings of 20 to 500 employees as opposed to 500 and more and, as you can see, it's dropped from close to 80 percent down to about 72 percent over the last 22 years, so that the trend is in the opposite cycle of what you would like it to be, and contradicts, I guess, some of what tend to be the more common assumptions about the small firm economy.

The last chart simply indicates——

Senator **Levin**. A quick question on that.

Mr. **Cleveland**. Certainly.

Senator **Levin**. Maybe. Looks like it's flattening out in the 1980s, that drop.

Mr. **Cleveland**. It is.

Senator **Levin**. Do you know whether from 1983, which is the last mark, has it continued to flatten out at all up to 1990, or don't we know that?

Mr. **Cleveland**. Unfortunately, Senator, this is the most recent manufacturing census we have and, as a number of people have pointed out, one of the disturbing things that's occurred over the last several years is the investment at the Federal level in the kind of data we need to understand the industrial system has decreased dramatically, so this is the most recent kind of statistics we can get. This material, incidentally, was put together by the Industrial Technology Institute in partnership with us.

The last graph indicates that this gap between small and large firms is significantly higher in the United States than it is in some of our competitor economies, and I'm sure that is probably not of great surprise to you. This is from a variety of sources of information, some of them foreign in nature.

To summarize, Senator, what we think are some of the reasons for this slower modernization of the smaller firms, a couple of points, very quickly. One, their exposure to international competition is more recent than that of their foreign competitors because they have tended to be able to survive on the strength of our domestic economy, whereas for a firm in Italy, for instance, the domestic economy is too small and they are forced to be international in their perspective.

Second, we have very weak relationships between large customers and their suppliers, what we refer to as original equipment manufacturers and their suppliers, and in other economies that relationship, certainly in economies like the Japanese economy, will tend to drive the modernization of supplier firms, and it tends to do it less here, although there's been a great deal of advancement in recent years.

Third, we have a very fragmented system for the distribution of information on new technologies and production practices. I think, as you indicated in your testimony, there are a limited number of programs like MMS in the country and there is no national program, and this can be contrasted with the Japanese system and I think also favorably with the success that we achieved in the Agricultural Extension Service.

Fourth, there is a fragmented system for skill training in our economy. It's uneven and the structural links between the system and its customers tend to be weak. We are attempting, in Michigan, to change some parts of that system and are achieving some success and, as I think has been pointed out, most of the public investments in job training are directed not at the existing workforce but at the dislocated workforce.

There are statistics that I think there is $800 million worth of training funds that come into Michigan from a variety of sources. Very few of those have anything to do directly with this manufacturing base.

There are also inefficient relationships between the vendors and users of technology. The market relationship does not usually work particularly well. There are inadequate structural relationships between universities and the firms that ought to be using their research.

As a point, we are working with the machine tool industry here in the State and discovered that the University of Michigan has one of the national experts in machine tool technology, Professor Sam Wu, and they are undertaking no fewer than 40 research projects related to the machine tool industry with their graduate students, and there was not a single Michigan firm that knew about them or was involved with them, and we're in the process of trying to facilitate a closer relationship so that that research is more directly related to the customers.

And last I'd like to make a point that as part of the research that we are participating in in the LAMP project indicates that trade unions and worker attitudes, which are usually identified as a significant barrier to technology adoption and modernization, were not identified as such by the firms that we surveyed. Fewer than 10 percent, and usually around 5 percent of the firms who are unionized, identified union issues as a problem, and fewer than 20 percent identified the vague attribute of worker attitudes as an issue. So that, contrary again, I think, to some public perception, is not a problem.

States like Michigan have demonstrated that serious industrial strategies, modernization strategies, can be carried out at the State level and I think the Federal report that you'll be looking at articulates some of those issues.

We have been a national leader in this process. I think we have some of the most comprehensive programs in the country: The Michigan Modernization Service, the Industrial Technology Institute, RTI, and the Applied Technology Center among them, and there are other States that are investing at the kind of levels we are, Pennsylvania among them, is one that stands out.

The point is that our success has demonstrated that this kind of activity can take place at the State level.

The fifth point I'd like to make is that we believe that the successful manufacturing economy of the future will have some very strong structural relationships between the public sector and the private manufacturing economy. We believe that you will see an approach to economic development that has two principles: One that applies the forces of the marketplace to determine principal "buy" decisions—if you look at issues of industrial policy where industrial policy has not worked, it tends to be where the public sector has attempted to influence or constrain buy decisions—coupled with very strong public sector support to support the competitiveness of the units that are competing in that system.

So a different approach is one that looks at an attempt not to attempt to control markets but, instead, an attempt to promote the modernization of the firms that are competing in that environment. And in this vein I think it is important for us to continue to take a look at the industrial system as a system and not just the performance of the individual firms in that system, and much of the kind of research we're doing here in Michigan with the LAMP project and others is to attempt to understand that full system.

And if you read the various reports that have talked about industrial competitiveness, they invariably come down to focus on key sets of relationships within that system as opposed to the competence of the individual firms.

We believe, for instance, that we have as good firm managers and owners and as good a workforce as anyplace else in the world, but we have a very inefficient system that hampers how well they can perform. Some of those relationships include relationships between customers and suppliers which work very differently here than they do abroad, between the vendors and users of technology, between universities and research and development institutes, between the educational system and those firms that employ workers.

There's a very inefficient system, for instance, in communicating some demands of industrial sectors to the educational system, relationships between management and labor and between lenders and users of capital.

So I would urge you, as you take a look at this issue, to think about the broad system as well as the individual firms themselves.

Last, almost last, there appears to us to be no real coherent national strategy on this issue. We are heartened by last year's Omnibus Trade Act which invested some source of funds in this activity, in the Hollings Centers and other activities. We did some analysis of the research and development budget at the Federal level and of the $60 billion that is invested, less than one half of one percent is related to this small- and medium-sized manufacturing firm economy. A quick calculation indicates that if you increase that from one half of one percent to 1 percent, you would have enough funds to buy a full CNC computer-aided design system for every tool and die shop in the United States of America. That will give you a little bit of a sense of how the difference in the investment might occur.

Lastly, I'd like to emphasize that we at the State level would welcome and would benefit greatly from a more powerful and effective Federal partner in this work, and I'd like to highlight a couple of areas where I think it would be particularly useful to us.

First, the development of a clear national strategy under which these kinds of activity can take place; some coordinated research and development on a sector by sector basis; increased support for the development of a national education and training system; and, lastly, direct financial support to States like Michigan that are engaged in this kind of activity.

And lastly I would mention an issue, Senator, which is not really part of your agenda, which we have come across recently, which is the issue of antitrust for small firms. We are increasingly working with groups of firms to help them cooperate among themselves to solve problems that they cannot solve individually. Antitrust issues for small firms are a significant barrier to that kind of activity, and I know there is some legislation circulating in Congress to exempt firms of a particular size from some of the requirements of antitrust and, if that's an issue that you end up focusing on, we would urge your consideration of it.

Thank you for the opportunity to provide input. We applaud your initiative and look forward to ways in which we can work with you.

[The prepared statement of Mr. Cleveland follows:].

MMS

Testimony of John Cleveland, Director
Michigan Modernization Service
Michigan Department of Commerce

To

Senate Subcommittee on Innovation, Technology and Productivity
Senator Carl Levin, Chair

December 19, 1989

SUMMARY OF KEY POINTS

1) Small firms matter.

2) Reasons for slow modernization include:

   - More recent exposure to the demands of international competition
   - Weak OEM (Original Equipment Manufacturer) to supplier relationships
   - Fragmented systems for information distribution on new technologies and production practices
   - A fragmented system for skill training
   - Inefficient relationships between vendors and users of technology
   - Inadequate structural relationships between industry and research universities
   - Trade unions and worker resistance to change are not major barriers to technology adoption

3) Modernization of the industrial base of foundation firms is a necessary condition for the renewal of U.S. manufacturing in the 1990s.

4) Progressive states like Michigan have demonstrated that serious industrial modernization strategies can be carried out at the state level.

5) Successful manufacturing economies of the future will see strong structural partnerships between the public sector and the private manufacturing economy.

6) We must maintain a focus on the need to improve the full industrial "system", and not just on providing assistance to individual firms.

7) There appears to be no coherent national strategy toward modernization of our manufacturing base.

8) The work of states like Michigan could be made much more powerful and effective if we had a strong and resourceful federal partner.

Good morning. My name is John Cleveland, and I am the director of the Michigan Modernization Service (MMS), a program of the state Department of Commerce. The mission of MMS is to:

> "Increase the productivity of small- and medium-sized manufacturers in Michigan, the skills and incomes of their workforce, and the competitive strength of the Michigan firms that purchase their goods and services."

The services of MMS are carried out in partnership with the Industrial Technology Institute in Ann Arbor, and the Applied Technology Center here in Grand Rapids.

MMS provides customized consultations to small- and medium-sized manufacturers in the areas of technology deployment, workforce development, and market analysis. These services are provided free of charge. MMS is support by general fund tax revenues appropriated by the Legislature, and also receives funding from the Michigan Strategic Fund in the Department of Commerce.

In addition to providing direct consultations to individual firms, MMS works with manufacturers, trade associations, researchers, vendors, community colleges, and others to create a public and private infrastructure capable of supporting the continuous modernization of the Michigan manufacturing base.

MMS is now in its fifth year of operation. We have worked with over 550 Michigan manufacturers, representing 55,000 workers, and $7 billion in annual sales.

We would like to share with you some of the lessons we have learned that we believe are relevant to the goal that we share in common -- modernizing the American industrial base in order to protect jobs and preserve and increase our standard of living.

1) Small Firms Matter

There are 120,000 manufacturers with 20 to 500 employees in the U.S. They employ 10.4 million workers, pay $222 billion in wages, and produce 46 percent of the value added in U.S. manufacturing. In Michigan, there are 5,900 such "foundation" firms, and they employ 441,000 workers, with a payroll of $11 billion. In all, they account for close to half of the Michigan manufacturing economy.

The proportion of the manufacturing base represented by small- and medium-sized firms has been increasing steadily. In the U.S., between 1967 and 1986, foundation firms added 1.4 million jobs, while those with 500 or more employees lost 1.1 million. In Michigan, the percent of manufacturing employment represented by foundation firms increased from 37 percent in 1979 to 44 percent in 1986.

The point of these statistics is that while large manufacturing establishments tend to be the focus of most debates about the competitiveness of American manufacturing, smaller firms represent close to half of the manufacturing economy, and, as will be argued below, are a more logical focus of public industrial competitiveness strategies.

2) **Smaller Manufacturing Firms Lag Larger Firms In Technology Adoption And Productivity**

Despite numerous notable exceptions, the foundation firm economy as a whole is technologically backward, and lags the large firm sector in productivity. In addition, the productivity gap between large and small firms is growing, not diminishing.

The charts attached to this testimony indicate that:

-- Rates of key technology adoption are less than 50 percent that of larger firms;

-- The productivity gap between small and large firms is large, and growing, and

-- U.S. foundation firms lag their international competitors in technology adoption.

Our experience indicates that there appear to be a number of reasons for the slower modernization of foundation firms:

-- More recent exposure to the demands of international competition. Compared to many foreign economies, the U.S. economy is a newcomer to the demands of international competition. Many U.S. firms have been able to survive on the strength of the domestic market alone. Firms in countries with smaller domestic economies have been forced to look to international markets for sales.

-- Weak OEM (Original Equipment Manufacturer) to Supplier Relationships. In many foreign economies, the relationship between OEMs and their suppliers is a key impetus for modernization. These relationships tend to be long term in nature, and are governed by concerns other than just market concerns for low price. Customers and suppliers work in closer partnership to reduce cost and increase quality to the benefit of both parties.

The last several years have seen significant change in supplier relationships in many U.S. industries. In automotive, for instance, all domestic producers now have significant supplier development efforts.

-- Fragmented systems for information distribution on new technologies and production practices. The U.S. system for distributing information on new technologies and production practices is fragmented and inefficient. This can be contrasted, for instance, to the Japanese efforts to promote quality management, or our system for distributing information on new agricultural practices through the Agricultural Extension Service. Foundation firms, in particular, depend on an eclectic array of information sources, including trade press and equipment vendors.

-- A fragmented system for skill training. The U.S. system for training existing and new workers is uneven, and lacks serious structural connections with its customer base in industry. This can be contrasted with sophisticated systems in Europe, Scandinavia, and Japan designed to develop the skilled workforce needed by industry.

-- Inefficient relationships between vendors and users of technology. The market relationship between vendors and users of technology is in many areas inefficient, and inhibits the adoption of existing technologies, and the development of new ones.

-- Inadequate structural relationships between industry and research universities. U.S. manufacturing firms, and especially small- and medium-sized establishments, are failing to get adequate benefit from the research and development resources of our universities, because much of the research is carried out with no connection to the firms who should benefit from it. In Michigan, for instance, we found that there was significant research on machine tools occurring at a major university without there ever being any discussion with Michigan machine tool builders. The needs of manufacturing firms should be more directly driving the university research agenda.

-- Trade unions and worker resistance to change are not major barriers to technology adoption. Research carried out by MMS and the Industrial Technology Institute indicates that fewer than 10 percent of unionized firms identify the trade union as a barrier to technology adoption, and fewer than 20 percent of firms identify "worker attitudes" as a barrier.

3) Modernization Of The Industrial Base Of Foundation Firms Is A Necessary Condition For The Renewal Of U.S. Manufacturing In The 1990s

Raising productivity and increasing market share for small- and medium-sized manufacturers is essential to improving U.S. economic performance and restoring our living standard. Poor performance of this sector costs the economy as whole, and damages the productivity of the larger firms to which they sell their goods and services. Large manufacturers require a modern and productive supplier base if they are to compete in world markets.

Since small- and medium-sized firms produce half of the value-added in the economy, a 10 percent increase in their productivity has as much effect on larger manufacturers as a 10 percent increase in their own productivity.

4) Progressive States Like Michigan Have Demonstrated That Serious Industrial Modernization Strategies Can Be Carried Out At The State Level

Most of the innovative public strategies to speed the modernization of the U.S. manufacturing base are being carried out at the state level. States are serving as the "laboratories" of industrial change and are experimenting with and implementing an unprecedented range of modernization strategies. These include:

- Direct technical assistance to individual firms;
- Development of a technical training infrastructure throughout the community colleges;
- Support for the development of new technologies through non-profit "Centers of Excellence";
- Encouraging closer connection between university-based research and the R&D needs of manufacturers.

Michigan has been a national leader in the development of state strategies directed toward the modernization of the manufacturing base. Efforts like the Michigan Modernization Service, the Industrial Technology Institute, the Applied Technology Center, and the Research and Technology Institute are testimony to this commitment.

5) **Successful Manufacturing Economies Of The Future Will See Strong Structural Partnerships Between The Public Sector And The Private Manufacturing Economy**

Structural partnerships, not cooperation, will characterize public-private relationships in successful economies of the future. These relationships will be based on the following two principles:

-- The forces of the market place are a powerful and effective allocator of resources. Efforts to excessively influence "buy" decisions of the market place (with some exceptions, such as those related to natural resources and the environment, where the market is too short-sighted to account for the long-term public good) are usually ineffective and inefficient. Exposure to the forces of competition are a necessary condition of world class competitiveness.

-- The public sector has an obligation to support the capacity of individuals, businesses, and communities to compete in the open market place. There are many areas where the public sector has a comparative advantage over the private sector, and where public investments are needed to support the ongoing competitiveness of the private manufacturing economy.

The public sector can be a particularly strong partner to small- and medium-sized firms in those areas where the economies of scale make the cost of information or investment prohibitive to the individual firm. These areas include: basic research and development, collection and distribution of information on new technologies, some forms of market information, and the development of a skilled labor force.

6) **We Must Maintain A Focus On The Need To Improve The Full Industrial "System", And Not Just On Providing Assistance To Individual Firms**

In report after report on the American manufacturing economy (most recently the Made in America report from MIT) we find that the focus is not on the competence of the individual firms in the economy, but rather on the key sets of relationship that make up our industrial production "system". To steal a point from the good Dr. Deming, the design of the system accounts for over 85 percent of the output of the system; the individual effort of the units working within the system account for less than 15 percent. In our economy, some of the key relationships in the system include those:

-- Between large industrial customers and their suppliers;

-- Between vendors and users of technology;

- Between universities and other research and development institutions, and those firms that apply the research to practical problems;
- Between the educational system, and those firms that employ skilled labor;
- Between management and labor;
- Between lenders and the users of capital.

An effective national industrial strategy will focus on the improvement of these key relationships, as well as on the building of the internal competitive capacity of individual firms.

Many of our competitor economies are beating us in the market place, not because their business owners are smarter than ours, but because they have a more competitive system than ours. Individual firms and their workers are supported by a system that supplies research and development related to their specific industry needs, skilled labor as it is needed, capital in usable and affordable forms, production technology appropriate to the products being produced, and long term relationships with key customers.

(It should be noted that our system continues to be more competitive than many others in the world. This however, is not good enough. If we want to protect our standard of living, we must seek to be the best in the world.)

7) **There Appears To Be No Coherent National Strategy Toward Modernization Of Our Manufacturing Base**

Many of the issues faced by our customers could best be addressed on a national, not a state level. These include:

- Intelligent management of our trade and export relationships;
- Competitiveness issues related to key industrial sectors, (e.g., machine tools, tool and die, precision metalforming, powdered metals, plastics, etc.);
- Coordinated development of key "horizontal" process technologies (e.g., CAD, MRP, Quality Management, etc).

Unfortunately, to date we have been unwilling to adopt a national strategy toward the modernization of our industrial base. Most of the effort that exists is defense-related, and is targeted only at those firms that supply the defense industry.

History indicates that national strategies for industrial development can work. We did it in agriculture, and we succeeded. As a result, we have the most productive agricultural sector in the world. Agriculture, however, employs only a fraction of the workers employed by the manufacturing sector. It is time for us to apply our national resources to the manufacturing sector, on the same scale that we applied them to the agricultural sector.

8) **The Work Of States Like Michigan Could Be Made Much More Powerful And Effective If We Had A Strong And Resourceful Federal Partner**

Michigan is a clear national leader in the development of state strategies to modernize our manufacturing base. We have broken important ground, and are providing key services to our manufacturing customers. The lack of a federal partner with a clear strategy, and strong resources is, however, a clear loss to us. The following resources would assist us in our work:

-- Development of a clear national strategy aimed at improving our "industrial system" and strengthening the competitiveness of small- and medium-sized manufacturers.

-- Coordinated research and development, on a sector by sector basis.

-- Support for the development of a national education and training system designed to provide the skilled labor force needed by manufacturing.

-- Direct financial support to states in their efforts to provide services to individual firms.

Thank you for the opportunity to provide input on these issues. We applaud your initiative in seeking ways in which the federal government can be a useful partner with states in the modernization of our manufacturing base. We look forward to working with you on these important policy issues.

... But Small is Not (Yet) Beautiful ...

Productivity by Sector

Top 4 Firms 121% of Average, Bottom Half 77%

Hourly Production Payroll, 1987

500+ $13.88 <100 $7.95

Unionization, 1986

500+ 40% <100 6%

The Industrial Technology Institute

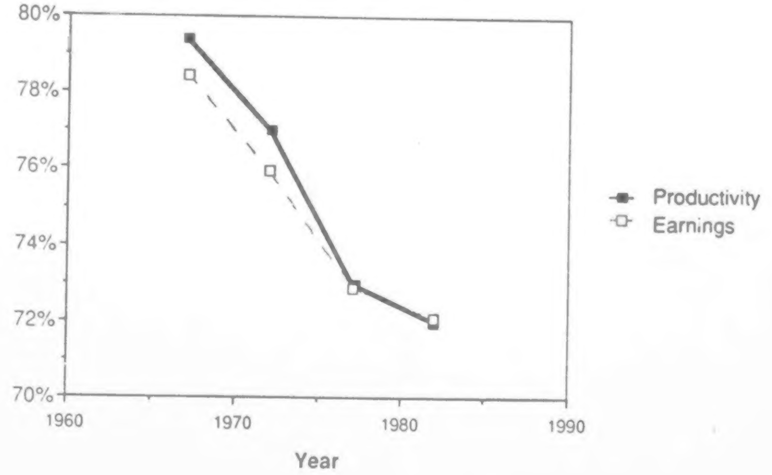
INDUSTRIAL TECHNOLOGY INSTITUTE

... or Modernized

Technology Adoption Rate, 1986

	Employment Size		
	10-49	50-249	250+
PPIC	50%	77%	86%
SPC	18	37	60
CNC	15	20	50
PLCs	10	27	50
CAD	13	21	50

Productivity & Earnings in Mfg. Estabs. With 20-499 Vs. 500+ Employees



Source: Census of Manufactures

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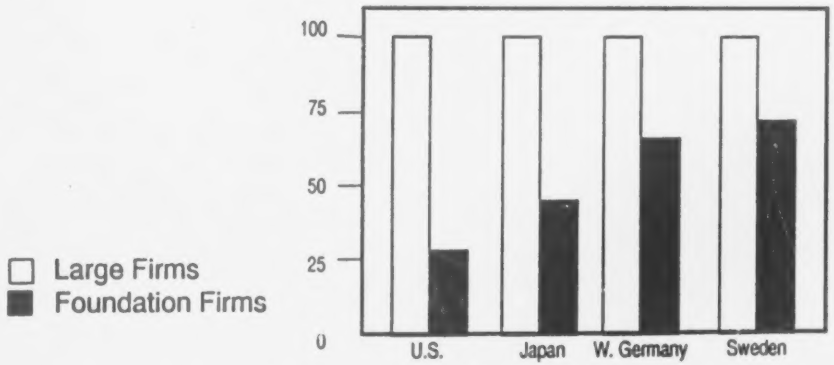
U.S. Foundation Firms Relatively More Backward



(Index: Large Firms Adoption Rate = 100)

Source: IG Metall, "Machinen Wollen Sie, Uns Menschen Nicht: Rationalisierung in der Metallwirtschaft," 1983; and OECD, "Industrial Robots," 1983; Daiwa Securities interviews;. ITI, Frostbelt Automation, 1987.

The Industrial Technology Institute

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Senator **Levin**. Thank you, Mr. Cleveland.

You mentioned during your testimony that there's no national program that supports MMS. Do you know of any proposal for a national program bill in either the House or the Congress which would provide support?

Mr. **Cleveland**. No, I'm not aware. The one legislative issue that I'm aware of is funding for what are referred to as the Hollings Center which the Omnibus Trade Act has authorized. There's authorizing legislation and I know that there was some funding authorized for the first year, but I understand it was much less than what they were planning. They were planning on funding a system of, I think it was, 25 such centers through the country and so far I believe they've only funded three, and I'm not sure where the appropriation is for the second year. But in terms of new legislation I'm not aware of any.

Senator **Levin**. How do those centers compare to the MMS?

Mr. **Cleveland**. The centers would really be designed to complement the kind of work that MMS is doing. They are designed to be a little—to focus a little bit on some of the earlier stages of the technology pipeline. Really, I think it's been said a number of times, most of our customers don't need new technology, they need to adopt and use the technology that already exists, and my understanding is that the centers would focus more—a little bit earlier in the technology chain, more on the development side.

Senator **Levin**. Dr. Chubb, in your chart, your survey, you did not, I don't believe, show capital unavailability as one of the problems. Is that because that survey focused more on manpower issues?

Dr. **Chubb**. The survey really focused more on the technology issues and technology needs. There were some questions that did relate to the capital areas that are in the executive overview report, but the majority of focus is looking at training workforce and education and——

Senator **Levin**. Because that's the major problem that is faced by small business in installing new technologies or just because the focus was on workforces?

Dr. **Chubb**. I think the focus was more on workforce issues and that's what RTI stresses.

Senator **Levin**. Would either of you care to comment on which is the greater problem for small businesses, the unavailability of capital to install the existing technologies or unavailability of a trained workforce? How would they rate in terms of a problem for small businesses to install new technologies?

Dr. Chubb, why don't you go first?

Dr. **Chubb**. My feeling is from the data I've seen and area of focus that I see the greatest need is in a balanced approach across the board from the standpoint you can have all the greatest equipment in the world installed but if you don't have a workforce there that is really trained and can use it effectively it can be a negative factor in productivity.

Senator **Levin**. Does your summary compare the unavailability of capital to some small businesses as a problem to the lack of a trained workforce? Does that summary compare those two?

Dr. **Chubb**. Yes.

Senator **Levin**. Which is the greater problem from the point of view of the small businesses? Do you have that offhand?

Dr. **Chubb**. I don't really have it offhand.

Mr. **Cleveland**. Senator, as I recall from a number of other LAMP reports—and, incidentally, we will be producing a LAMP report for the State economy as a whole in March which I think you will find particularly useful, and we certainly will distribute to the delegation—actually there was a relatively low response rate that identified access to capital as a problem. We think, however, that that may have something to do with the way we asked the question. We think it ended up being more related to working capital, day-to-day working capital, rather than investment capital.

At MMS we don't deal directly with financing needs of employers but we have begun to have some discussions with the Michigan Strategic Fund and also with the banking community in the State to better understand these issues. We think that some of it is a function of the kind of communication that occurs between manufacturers and the banking world. It is very difficult to know the detail. The financing needs of manufacturers vary by what sector they are in. An injection molder and machine tool builder have very different kinds of capital needs, and it is difficult for banks to fully understand that diversity. So we suspect that one of the issues is going to be better communication between the manufacturing sector and the lending processes.

Senator **Levin**. Dr. Chubb, in your testimony I think you said that 40 percent of the small businesses said that they had no computer——

Dr. **Chubb**. Controlled equipment.

Senator **Levin** [continuing]. Controlled equipment or aided design equipment. What percentage of that 40 percent are prospects for that kind of equipment? Do we assume that all of that 40 percent or most of that 40 percent are prospects?

Dr. **Chubb**. I think most of that 40 percent is prospects, certainly at different levels, but you can get some very inexpensive PC-based systems now which can be very effective in the smallest of companies.

Mr. **Cleveland**. Senator, I would add to that one of the things that came through both the LAMP research and other research that we've done is that there are fairly typical identifiable sequences to technology adoption that vary by the kind of industrial sector that you are in. So a metal cutting business will typically first purchase computer-aided design, then purchase computer numerical controlled equipment, then get the capability to link the two together, then go to automated inspection, then go to automated production planning and inventory control. And one of the disturbing things we end up seeing, and that is the typical progression, is very consistent across all the studies, is that you can go to the firms that have CAD and CNC and we ask them, "What's the next technology you're going to purchase?" And only a small percentage of them say, "We are going to go to computer-aided manufacturing," or, "We are going to go to production inventory control," or, "We are going to go to automated inspection." So it begins to be a question of how much are they thinking about what the next technology is that they ought to adopt and at least the information we've gotten back is that many of them are not—are not thinking yet in terms of the next progression they ought to take.

Senator **Levin**. How many States have something like MMS, did you say?

Mr. **Cleveland**. I think there were 13 identified in the NGA study.

Senator **Levin**. And how many RTIs are there either in Michigan or around the country? Can we identify the number in Michigan, for instance, is there anything like it?

Dr. **Chubb**. There's really multiple centers of excellence in the State, but RTI has really got considerably different focus than any others. We are definitely in the applied application area, not looking at the state-of-the-art, you know, development of new technologies, but applying what's already there. There are very, very few in the country that really have that focus.

Senator **Levin**. Any others in Michigan?

Dr. **Chubb**. Really the closest one would be the Industrial Technology Institute, but again it's a considerably different focus than ours.

Mr. **Cleveland**. I would add to that, Senator, the Michigan Biotechnology Institute which is focused on the biotechnology industry and, as I understand, there also is emerging very soon to be launched a Materials Processing Institute that is designed around the same kind of concept. RTI is the only one of these institutes that is geographically regional in its focus and that's really what makes it unique.

Senator **Levin**. All right. Thank you both.

Mr. **Cleveland**. Thank you.

Dr. **Chubb**. Thank you, Senator Levin.

Senator **Levin**. I appreciate your coming.

Our next panel, which will address the question of specific experiences with high technology in small businesses, consists of Beth Kelly, vice president of Human Resources for Cascade Engineering; Gene De Fouw, president of Alofs Manufacturing; and Carl Brown, vice president and COO of Nicholas Plastics.

Will you all come forward. Thank you for coming today with your testimony.

Ms. Kelly, we'll start with you.

STATEMENT OF BETH KELLY, VICE PRESIDENT OF HUMAN RESOURCES, CASCADE ENGINEERING, GRAND RAPIDS, MI

Ms. **Kelly**. Thank you, Senator Levin. I have what in manufacturing we call just in time reports for you.

Thank you for the opportunity to speak today on some of the issues and opportunities we face in preparing employees for today's technologies. Allow me to give a brief history of Cascade Engineering's experiences.

Cascade is a manufacturer of plastic injection molded products. We began our operations 15 years ago as a supplier to the office furniture and automotive industries. Since then we have expanded to an operation with four facilities, 33 injection molding machines, and 440 employees. Our growth during the last years has been primarily because of our commitments to serving the customer, continuously improving the business, and taking care of Cascade's employees.

I'm the vice president for Human Resources at Cascade Engineering. In that capacity I am charged with establishing programs and policies which provide employees with the tools, skills, and motivation to produce the best quality product for our customers.

Like many U.S. manufacturers we've experienced many changes in the way we do business in the past 5 years. We have gone from a workforce which required very few skills and a total of 2 hours training to a workforce which is required to take three different tests prior to being hired and must enroll in a minimum of 20 hours of classroom training during their first 6 months of employment. Over 35 percent of our workforce today is considered skilled. Five years ago that number would have been closer to 15 percent. Today there are automated handling systems, robots, working daily in every plant. Five years ago there was one robot that sat in the corner of our storage facility, nobody could figure out how to run the darned thing. There are over 100 computer terminals on desks and work stations today that can be used by any of our 440 employees. Of those, 35 are personal computers. Five years ago there were only five terminals, one for each of the members of the data processing department.

There are two stages to our technology revolution at Cascade. The first is the hardware, machines and mechanisms that are put into place. The second stage is the software, the systems and education that make those machines meaningful. That has been our challenge during this period.

We are not primarily a technology center. We are a manufacturer. We make plastic parts. Yet we have been called upon to prepare our employees to make these parts with some very sophisticated processes. This has required a very aggressive training stance.

We talked earlier of the required classes for all employees. We start with orientation to introduce the employee to the company. Then we train them in problem-solving skills, pretty basic stuff that sets the groundwork for future education. We take advantage of every opportunity we have to train these employees. We use our suppliers to offer courses on specific equipment. We look to private consultants and community resources to offer classes to employees. We depend on our Educational Reimbursement Program to develop many of the more advanced skills.

In 1989 there were 22 classes above and beyond our basic program held at Cascade Engineering for our employees. Fifty percent of our employees participated in these classes. Another 20 percent of the employees took classes at local colleges and universities through our Educational Reimbursement Program.

During the year we spent $130,000 for internal classes and $26,000 for educational reimbursement, bringing our total education budget for the year to $156,000.

What types of classes do our employees take? Most of the training prepares employees for problem-solving opportunities. In order to compete in a world class marketplace we must be committed to continuous improvement, the Japanese call this kaizen. Every employee at Cascade is taught how to identify problems, collect data and information to support their theories, and systematically test and implement solutions. Perhaps this appears to be simple stuff, but this is the frame that holds the rest of our employee development efforts together.

Beyond problem-solving we encourage technical training in quality assurance techniques, SPC, design of experiments, and advanced quality planning, specific knowledge of equipment and machinery and management tools like supervisory training, communications, and time management.

Every employee at Cascade Engineering is committed to self improvement and is offered every opportunity to improve their skills. We are lucky, not every organization has the commitment to employee education that Cascade does. Yet education and training is mandatory for global competition. What can the Government do to support these efforts?

Well, first, let's talk about the IRS Code Section 127. This is the provision for tax free educational reimbursement for individuals taking job-related course work at colleges and universities. Why is there even thought of dropping this? At a time when small businesses need to use every resource available, the Federal Government continues to consider eliminating this option for employees. For the past two years businesses have been in limbo waiting for Congress to make a decision. Eleventh-hour extensions will hold us until next September, but they don't show a strong support for corporate education.

We're very fortunate in Grand Rapids to have excellent resources for referrals to State and Federal grants and other funding. C.J. Shroll and his office have been particularly helpful in obtaining monies for training. It's not enough, though. Not one cent should be left in the coffers for training programs at the end of the year. Small businesses don't receive regular communications regarding the funding programs to assist in training. Valuable resources are either being wasted or concentrated with those who know the system. A broad-based communication effort could spread the word to all those who would benefit from available programs.

We often step into training programs with no conception of what skills our employees currently possess. Furthermore, many training professionals do an abysmal job of measuring the results of their training programs. Federal and State dollars would be well spent on identifying and upgrading skills and for developing accurate measurements of training results.

Finally, we must not forget our public school system. This institution has the assignment to prepare tomorrow's workers and is the most critical link to our success. Much of the training Cascade Engineering is doing today could have been done by the public schools yesterday. Cascade Engineering's future depends on the future of the educational system. As a result, we have taken a more active role in the schools, including participation in a business partnership with the local elementary school. This may be the only way to effect change in our public education system. We would encourage Congress's support of business school alliances as a commitment to tomorrow's workforce.

Yesterday's picture of a small business was mom and pop hanging out a shingle to service their neighbors on the street where they lived. Advancements in communication, transportation, and other technologies have placed the small company right in the middle of the business battle. Small businesses show an agility and flexibility that is unheard of in a large corporation. To that extent they have a very important part in shaping the role of manufacturing in the United States. I'm pleased to see such strong interest in opening technology's doors for these organizations.

Senator **Levin**. Ms. Kelly, let me ask you a few questions, because I know you have to leave. You said the Federal Government should support business school alliances. In what way should we support them?

Ms. **Kelly**. I would like to see more Federal interest in some of the local community programs that are going on. In Grand Rapids we have the public education fund, this is a group that sponsors the business alliances and works very hard on that. Any kind of increased support, either in program management or in funding from Washington, would certainly be helpful.

Senator **Levin**. Has there been any change in the technical skills of new workers that you're getting over the past few years, for better or worse, or have you noticed any shift at all?

Ms. **Kelly**. I don't think we've noticed a shift in the actual skill level of the employees. What we have noticed is the shift in our requirements for skill levels. There has not been a decline over the past 5 years, but we have an increased need to have people who have much more knowledge and information than what we are currently getting.

Senator **Levin**. And what's been your connection with RTI?

Ms. **Kelly**. We've worked with RTI in helping to develop the program. My boss, Fred Keller, who is the president of Cascade Engineering, also is an active member on RTI's board.

Senator **Levin**. You've put a great deal of emphasis on training workers. Have you had difficulty in getting capital for machinery, is that a problem or is it mainly getting skilled and trained workers for that machinery that's the problem?

Ms. **Kelly**. That's a good question. Obviously, in my position, I don't have to deal with the capital for the machines as much as others do. Our experience with getting trained people has been that we are competing in Grand Rapids specifically with some very large, very fine employers, and they have a reputation nationally and, perhaps, internationally for being some of the best companies to work for. We are challenged to hire people away from the Steelcases, the Hermann Millers, the General Motors, and into Cascade Engineering. Other small companies also face those challenges and it's very difficult for us to compete with the wage rates and with the benefit structures that are established in those large companies. That, I believe, is our most difficult challenge right now in finding good people for our organization

Senator **Levin**. Thank you. I do know you have to leave.

Ms. **Kelly**. I'm sorry I have to leave you this afternoon.

[The prepared statement of Ms. Kelly follows:]

Cascade Engineering

SUMMARY OF REMARKS MADE BY BETH KELLY, CASCADE ENGINEERING

Senate Subcommittee on Innovation, Technology and Productivity
December 19, 1989

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There are two stages to our technology revolution at Cascade. The first is the hardware - machines and mechanisms that are put in place. The second stage is the software - the systems and education that make those machines meaningful. That has been our challenge during this period.

We are not primarily a technology center. We are a manufacturer. We make plastic parts. Yet we have been called upon to prepare our employees to make these parts with some very sophisticated processes. This has required a very aggressive training stance. We talked earlier of the required classes for all employees. We start with orientation to introduce the employee to the company. Then we train them in problem solving skills - pretty basic stuff that sets the groundwork for future education. We take advantage of every opportunity we have to train employees. We use our suppliers to offer courses on specific equipment. We look to private consultants and community resources to offer classes to employees. We depend on our educational reimbursement program to develop many of the more advanced skills. In 1989 there were 22 classes above and beyond our basic program, held at Cascade Engineering for our employees. 50% of our employees participated in those classes. Another 20 percent of our employees took classes at local colleges and universities through our educational reimbursement program. During the year we spent $130,000 for internal classes and $26,000 for educational reimbursement, bringing our total educational budget for the year to $156,000.

What types of classes do our employees take? Most of the training prepares employees for problem solving opportunities. In order to compete in a world class marketplace we must be committed to continuous improvement (the Japanese call it kaizen). Every employee at Cascade is taught how to identify problems, collect data and information to support their theories, and systematically test and implement solutions. Perhaps this appears to be simple stuff - but this is the frame that holds the rest of our employee development efforts together. Beyond problem solving we encourage technical training in quality assurance techniques (SPC, Design of Experiments, and Advanced Quality Planning), specific knowledge of equipment and machinery, and management tools like supervisory training, communications, and time management.

Every employee at Cascade Engineering is committed to self improvement and is offered every opportunity to improve their skills. We're lucky - not every organization has the commitment to employee education that Cascade does. Yet education and training is mandatory for global competition. What can the government do to support these efforts?

First let's talk about the IRS Code Section 127. This is the provision for tax free educational reimbursement for individuals taking job related coursework at colleges and universities. Why is there even thought of dropping this? At a time when small businesses need to use every resource available, the federal government continues to consider eliminating this option for employees. For the past two years businesses have been in limbo waiting for Congress to make a decision. Eleventh hour extensions will hold us until next September, but they don't show a strong support for corporate education.

We are very fortunate in Grand Rapids to have excellent resources for referrals to state and federal grants and other funding. C.J. Schroll and his office have been particularly helpful in obtaining monies for training. It's not enough though. Not one cent should be left in the coffers for training programs at the end of the year. Small businesses don't receive regular communication regarding the funding programs to assist in training. Valuable resources are either being wasted or concentrated with those who "know the system". A broad based communication effort could spread the word to all those who would benefit from available programs.

We often step into training programs with no conception of what skills our employees currently possess. Furthermore, many training professionals do an abysmal job of measuring the results of their training programs. Federal and state dollar would be well spent on identifying and upgrading skills and for developing accurate measurements of training results.

Finally, we must not forget our public school system. This institution has the assignment to prepare tomorrow's workers and is the most critical link to our success. Much of the training that Cascade Engineering is doing today could have been done within the confines of the schools yesterday. Cascade Engineering's future depends on the future of the educational system. As a result, we have taken a more active role in the schools, including participation in a business partnership with a local elementary school. This may be the only way to affect change in our public education system. We would encourage Congress's support of business/school alliances as a commitment to tomorrow's workforce.

Yesterday's picture of a small business was mom and pop hanging out a shingle to service their neighbors on the street where they lived. Advancements in communication, transportation and other technologies have placed the small company right in the middle of the business battle. Small businesses show an agility and flexibility that is unheard of in a large corporation. To that extent, they have a very important part in shaping the role of manufacturing in the U.S. I'm pleased to see such strong interest in opening technology's doors for these organizations.

Senator **Levin**. Our next witness on this panel is Gene De Fouw, president of Alofs.

Mr. **De Fouw**. Thank you, Mr. Levin.

Senator **Levin**. Thank you for coming.

Mr. **De Fouw**. Thank you for giving me the opportunity to talk on the panel.

STATEMENT OF EUGENE A. De FOUW, PRESIDENT/CEO, ALOFS MANUFACTURING, GRAND RAPIDS, MI

Mr. **De Fouw**. To give you a little background on our company, it was formed in 1924, 65 years ago, and 4 years ago I purchased the firm, along with a partner, and from that point forward we've been trying to upgrade the skills of our employees and bring our company current in the area of technology and in the area of quality and new equipment. We service primarily the automotive industry. Some furniture, some appliance and plumbing, and some building products, but primarily our customer base is automotive. We have a plant here in Grand Rapids, about a 100,000 square foot facility. We export to Mexico, Canada, Puerto Rico, Hong Kong, and England. Most of these exports are to large firms that have plants in those countries and, therefore, we ship the product to their plants in those countries. Our growth rate in the last 10 years has been a little over 100 percent, about 10 percent a year, growing from 86 to 175 people, for instance, and from $9.8 million in sales to over $20 million in sales.

A little background on the industry trends that we see. The auto and the large nonauto companies, OEM firms, are demanding extremely high quality, on-time delivery, very low cost. Their supplier optimization, or supplier reduction, has taken place, and so we're seeing greater emphasis on staying with the present customers we have, building relationships with these firms, but still trying to win some new customers as well.

There's a great emphasis on suppliers doing R&D and design requirements, as compared to what it was in the past, and this has, of course, added cost to us, but they really don't want to pay any more money for those parts, even though our overhead cost is greater.

The state-of-the-art technology and equipment that's required to remain competitive in a world market is extremely high and is much larger than what we've seen in the past. All of this places a tremendous amount of financial demand on the supplier community and the supplier company, which are the foundation manufacturing firms of Michigan and, I believe, our country as a whole.

The new supplier foreign transplant firms that are coming into America have a distinct advantage over us. They get State aid for land. They get State aid for training. They get new State tax abatements for equipment, plus their workforces are well screened forward at the young, and therefore they do not have a substantial retirement or medical financial cost load on them as existing older firms do, such as ours, 65 years old. The average employee seniority at Alofs, I have about 25 people with over 25 years seniority, and the average seniority is around 12 to 15 years in the plant. So we're looking at a much higher financial burden there.

We're also competing against foreign financial banks, I should say we're competing against foreign companies that have foreign financial bank backing, and they are managing from the long term perspective, as you mentioned earlier. They accept losses in some of these firms for 5 to 10 years before they show a profit, but they know they are going to get market share, and this is going to result in a dominance in the market.

That's not the perspective of our bank community. Plus generally they are operating from brand new plants, in new industrial parks, with state-of-the-art equipment that's been purchased through foreign trade zones from foreign manufacturers.

And I believe the American firms need an equivalent balance from our Government, existing companies need that balance.

Some of the problems that are facing metal stamping foundation firms—when I talk about foundation firms I'm talking about the same firms that John Cleveland was speaking of, 20 to 500 employees. There's an extreme cost pressure on a firm such as ours.

For instance, in the last 4 years steel prices have gone up 38 percent, but we have not been able to get any relief from our auto customers or from any of our large customers. In other words, they've not been willing to accept pass-throughs of those steel price increases. If we insist on cost increases, we lose the business, so our margins have deteriorated substantially which takes away from profits from which we make capital investments in training and technology.

We've experienced deterioration of our profit margins and we are now unable to make these kinds of investments. Look at people training, for instance, the cost of training, the wage cost during the training, the loss of production during training, even the retention and replacement cost, because in our situation we found that when we did the training we got a lot of notoriety for it and we found some of the other firms in our community were stealing our people because it was cheaper to hire our trained people than go through the training programs. All in all, we've benefited. However, because I think we have picked up better people as a result of it, but it still adds up to a substantial amount of money. Our firm spent $250,000 in 1987—25 percent of that cost was picked up by the Michigan Modernization Service.

In the area of capital investment, costs for new equipment are sort of lumpy. They are available only in big, expensive chunks, and without purchase orders to specifically fill new equipment we cannot get a bank to finance it. We have been able to get some large contracts and because of those contracts we needed certain equipment and we could finance with the customer purchase order as collateral, but without that we can't go out after new technology, new equipment, and to try to fill that equipment with new business.

So without profits we can't make investments in equipment, or make major upgrades in the purchase of state-of-the-art equipment.

The third area is technology. We are looking at expensive investments, you get the return in a long-term basis, like CAD, robots, lasers.

These other two things kind of fit together, training and equipment, but purchasing technology, that takes a long time before you see results and receive paybacks on those kinds of investments.

So as an overview, I'd like to say that Alofs has had very good experience with MMS and RTI in Michigan. However, the cost of the training that's picked up by the State has only been about 25 percent of the total cost. However, we feel it has helped us become an example of successful training of employees for a foundation firm, but it has also affected the short-term profits of the company. If I were looking at strictly trying to show short-term gains and show profitability each year, I would not have made these investments. I do think it's going to serve the company well in the years to come.

The East Asian countries have devised an industrial policy that enables their public sector to focus tax benefits, accelerated depreciation, R&D tax credits, investment tax credits or refunds to establish manufacturing companies that represented their countries' future. These policies were established to encourage investment in the high-productivity technology and equipment to the manufacturing sector. These policies were created to help their domestic companies stay viable for the long haul, because staying power requires a lot of financial resources.

The American Government needs to look at the foundation manufacturing companies in providing incentives for those domestic foundation firms. This is not a foreign concept, it's a very American concept, and we must not only talk about incentives, we must act on them now, not 2 to 4 years from now. It is the only way we are going to make ourselves strong in competing with the East Asian manufacturing system.

So some of my specific recommendations are to allow manufacturing firms to stay lean and mean by helping us finance the cost of expensive equipment and new technology, and share with us in the cost of technology and training.

Let me suggest these proposals for discussion and evaluation by your Committee.

First, technology, the technology offered by RTI and ITI and Michigan Modernization Service and university research programs, I would like to suggest consideration to allow foundation firms to take tax credits of, say, up to one half of one percent of their sales or maybe put a lid of $100,000 per year for work sourced with those firms and done at those institutions on behalf of our industrial base. So we would be spending the money but we would get it back in the form of tax credits later.

In the area of people training——

Senator LEVIN. Get it back in the form of taxes?

Mr. DE FOUW. I'll tell you how you would——

Senator LEVIN. Get it back in the form of tax credits?

Mr. DE FOUW. We would get it back as a company as tax credits, but also the Government would get it back.

People training offered by Michigan Modernization Service or junior colleges, approved seminars that are put on by trade associations that upgrade the skills of the individuals, allow, again, foundation firms to take tax credits against their Federal tax obligations up to ½ percent of their sales or $100,000 per year for work done with these institutions.

Now, keep in mind that successful companies in the world should be spending 4 to 6 percent of their sales in training their people and they should be spending 4 to 8 percent of their sales in R & D and technology to be able to compete. Requesting ½ percent of sales is not a major portion of the successful company's budget. I would admit most struggling domestic firms spend zero, zero dollars on these endeavors today. When I purchased Alofs there was no money being spent in those areas at all, none. So tax credits would encourage them to start.

Capital equipment required to remain competitive or allow a company to move forward in a leadership position in the world market, there are several options. I'm not saying all three should be done, but here's three possibilities: Government financing, such as you mentioned in your opening remarks about the Japanese, of low interest loans for new equipment. Primarily I would make the suggestion it's like new equipment with delayed payback privileges at low interest loans so that we may not be able to make the payments back initially but 3 to 5 years from now, after the purchase has been installed and it's operational, and we would be in full production, and we'd have the cashflow to pay back that investment, much like you do for college students where they borrow the money and then after they are employed they pay back the loans.

Accelerated depreciation on new technology equipment. For instance, allow one-half of the normal depreciation time to purchase such equipment. Part of the reason for that program is that technology is changing so fast. We bought CAD 2 years ago and our CAD equipment will not take what they call level 9 and level 10 upgrades. So I have to either buy a new CAD or upgrade in other forms of memory systems or things of that nature. That technology is changing extremely fast, and making those investments today results in really having short-term equipment life—for shorter than the allowed depreciation schedule.

Now, another possibility in the area of capital equipment is tax credits of maybe up to 1 percent of sales or like $250,000 for purposes of new equipment.

These are just suggestions that I think would help America become competitive as the Asian nations have done. America's manufacturing companies and our country and our Government would benefit from implementing these types of proposals. They would benefit through improved productivity, as John showed in his charts that we were declining in that area.

Survival of a lot of our domestic foundation firms. Yes, some of them are surviving but they are being purchased through acquisitions and some of them, of course, are going under in this environment.

We could be showing increased employment resulting from the growth of foundation firms, and as a result of increased employment in the manufacturing sector you'll see increased employment in the service firms as well, like the CPA firms, legal firms, marketing companies, the food industry, the Federal and retail establishments, all resulting from manufacturing firm growth. And I'm told that these numbers, depending on each area, could number anywhere from two to five additional jobs for each job that's created in the manufacturing environment. As a result of that, the Government would have a growth in their tax base for Government taxing on wages.

So the investment they've made in industry through tax credits, and so forth, would be paid back over time. The money invested in these tax credits will be quickly returned to the Government through payroll taxes, and this program is an investment in economic survival of our own countrys' domestic foundation firms.

I would like to suggest that these tax credits be restricted to domestic foundation manufacturing firms that are, say, over 5 or 10 years old and not owned, affiliated, or joint ventured with any foreign firm, and all the equipment purchased would be purchased from domestic American companies and made in America.

I am confident that implementation of the above ideas will substantially help our American foundation firms. It would not only help them compete in the world market but could thrust these companies into a world leadership position, which I think we want.

I urge you and your Committee to give these proposals very serious consideration. We need these tax incentives now, not 2 to 5 years from now, by then it may be too late.

Thank you very much for your time.

Senator LEVIN. Thank you, Mr. De Fouw.

[The prepared statement of Mr. De Fouw follows:]

ALOFS
ENGINEERED EXCELLENCE
ASSEMBLIES/STAMPINGS/COPPER BRAZING

Eugene A. De Fouw
PRESIDENT/CHIEF EXECUTIVE OFFICER

To: Senator Carl Levin, Chairman

Subject: Testimony to the Senate Sub-committee on Innovation, Technology and Productivity

A. COMPANY BACKGROUND

Founded: 1924 - 65 years old
Employment: 175
Product Types: Assemblies (Auto 4x4 shifters, seat sub-assemblies); Stampings, Copper Brazed Assemblies; Power Steering Reservoirs); Deep Drawn Stampings.
Markets Served: Automotive, Furniture, Building Products, Plumbing and Appliance Industries.
Offices: Plant & Office in Grand Rapids; 100,000 ft.
Export: Mexico, Canada, Puerto Rico, Hong Kong, England
Growth: (last 10 years) From 86 to 175 people 103% increase
From $9.8 to $20.0 sales 104% increase

B. INDUSTRY TRENDS

The Auto & Non-Auto OEM firms are demanding high quality, on-time delivery and low cost. Supplier optimization (reduction) is taking place. R & D and design requirements are being forced on the suppliers. State-of-the-Art Technology and equipment is required to remain competitive in a world market. This all places tremendous financial demands on the supplier company, which is the foundation manufacturing firms of Michigan and our Country.

The new supplier transplant firms have a distinct advantage with state aid in land, training and tax abatements. Plus their work forces are well screened and young and they do not have the retirement and medical financial load that exist on older, existing American firms. They are competing against us with foreign financial backing, managing from the long term perspective (acceptable to loose money for 5-10 years and gain market share) and generally operating from new plants with new State-of-the-Art equipment brought in through foreign trade zones. We need an American equivalent balance from our government.

ALOFS MANUFACTURING COMPANY
345 - 32ND STREET, S.W. • GRAND RAPIDS, MICHIGAN 49548-1083 • PHONE: (616) 241-6405 • TELEFAX (616) 241-3244
1-800-678-7513

C. PROBLEMS OF METAL STAMPING FOUNDATION FIRMS

Due to extreme cost pressures on raw material (steel price increases of up to 38% in 4 years) with no relief from our auto customers and other large manufacturers. We experienced deterioration in our profit margins, and are now unable to make the necessary investments in training, new equipment and technology to compete with foreign firms and/or larger firms.

1) People Training - Cost of training, wage cost during training, loss of production during training, retention/replacement cost; all add up to a substantial amount of money (Alofs - 1988 - $250,000)

2) Capital Equipment - Costs for new equipment are "lumpy". They are available only in big, expensive chunks. Without orders to fill the new equipment, we cannot get bank financing. Without profits, we cannot make investments in equipment upgrades or purchase new, State-of-the-Art equipment.

3) Technology - New technology is an expensive investment with long term returns. i.e. CAD, Robots, Lasers, etc.

D. Overview

Alofs has had good experience with MMS and RTI in Michigan. However, the cost of our training picked-up by the State was only 25% of the total cost to Alofs. However, we feel it has helped us become an example of successful training of employees in a foundation firm, but it affected the short term profits of our firm.

The East Asian Countries devised an industrial policy that enabled the public sector to focus tax benefits, accelerated depreciation, R & D tax credits, and investment tax credits (or refunds) to established manufacturing companies that represented their countries future. These policies were established to encourage investment in high-productivity technology & equipment in the manufacturing sector. These policies were created to help their domestic companies stay viable for the long haul, because staying power requires a lot of financial resources.

The American government needs to look at the formation of manufacturing company incentives for our domestic foundation firms. This is not a foreign concept, it is very American and we must not only talk about incentives, we must **ACT NOW**, not years from now, and enact industrial incentive tax code changes. It is the only way we are going to make ourselves strong in competing with the East Asian Manufacturing System.

E. RECOMMENDATIONS TO FEDERAL GOVERNMENT

Allow American Foundation Firms to stay "lean & mean" by helping us finance the cost of expensive equipment and new technology and share with us in the cost of technology and training.

Let me suggest these proposals for discussion and evaluation by your Committee:

1) Technology - offered by RTI, ITI, MMS, University research efforts, etc.:

- Allow foundation firms to take tax credits of up to 0.5% of sales or $100,000/yr. for work sourced/done with these institutions.

2) People Training offered by MMS, Junior Colleges, Approved Seminars (Trade Associations,) etc.:

- Allow foundation firms to take tax credits of up to 0.5% of sales or $100,000/yr. for work done with these institutions.

Keep in mind that successful companies in the world should spend 4-6% of sales in people training and 4-8% of sales in R & D and technology to be able to compete. Requesting 0.5% of sales is not a major portion of the successful companies budget. I would admit, most struggling domestic firms spend zero on these endeavors today. Tax credits would encourge them to start.

3) Capital Equipment required to remain competitive or allow a company to move into a leadership position and grow. Several options are:

- Government financing on new equipment with delayed pay back provisions at low interest rates - i.e. Begin payments 3 to 5 years after purchase when equipment is in full production.

- Accelerated Depreciation on new technology equipment. Allow one half (½) normal depreciation time periods for purchase of such equipment.

- Tax Credits of up to 1.0% of sales or $250,000/yr. for purchase of new capital equipment.

America's manufacturing companies and our country and government benefit from implementing these proposals through:

1) Improved productivity growth.
2) Survival of domestic foundation firms.
3) Increased employment resulting from growth in the foundation firm.
4) Growth in the service firms (CPA, Legal, Marketing, Food, Medical, Retail, etc.) resulting from manufacturing firm growth. (2 to 5 service jobs for each manufacturing job)
5) Growth in the tax base for government taxing of wages, etc.

The money invested in these tax credits will quickly be returned to the government through payroll taxes, etc. This program is an investment in the economic survival of our own country's domestic foundation firms. I would like to suggest that these tax credits be restricted to domestic foundation manufacturing firms which are over 5 (or 10) years old and not owned, affiliated, joint ventured, etc. with any foreign firm. All equipment purchases must be from Domestic American Companies and made in the U.S.A.

I am confident that implementation of the above ideas will substantially help our American foundation firms. It would not only help them compete in the world, but would thrust these companies into a world leadership position in manufacturing.

I urge you and your Committee to give these proposals very serious consideration. We need these tax incentives **NOW**, not 2 to 5 years from now. By then, it may be too late.

Eugene A. De Fouw
President/CEO

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THE Q&A/STEVEN B. SCHLOSSSTEIN

WHY AMERICA NEEDN'T FEAR THE PACIFIC CENTURY

Enough handwringing about America's decline! It's not too late for the U.S. to bounce back as a stronger, more competitive nation. So argues Steven B. Schlossstein, whose new book, The End of the American Century, *has won the praises of everyone from Chrysler's Lee Iacocca to Sony's Akio Morita. It will be published in January. A consultant and a former vice president of Morgan Guaranty Trust Company who has studied and worked in Japan and East Asia for more than 20 years, Schlossstein is also the author of* Trade War. *In an interview with New York business writer Laton McCartney, he details what American managers must do to respond to the Asian challenge and revitalize American industry.*

Q **Are you really optimistic about America's future?**

A Ultimately, yes, even though we've seen the completion of the American century, in which the U.S. dominated the global stage and our corporations were without equal. Now, as we look forward to a world that America no longer dominates, the question for us is, How can we maintain and enhance our competitive strengths? What are the implications for us in a world where the major manufacturing corporations of Japan and West Germany are on a par with ours, where the 10 top banks are Japanese, and the major trading companies are dominated by Japan and the nations of East Asia?

Q **Not a cheery prospect.**

A No, but we have within this country the seeds of revitalization and renewal. And we are now beginning to see how the revitalization process can take place. At the same time, the popular theory that we are now moving from an American century to a predominately Pacific century is premature and overstated. From where I sit, a Pacific century without America is an oxymoron. On the other hand, an extension of the American century without the Pacific is nonsense. In short, Japan, the East Asian countries, and the so-called Little Dragons—Korea, Taiwan, Singapore, and Hong Kong—need us as badly as we need them.

"Japan, the East Asian countries, and the so-called Little Dragons need us as badly as we need them."

What caused the balance of power to shift to East Asia?

We deemphasized manufacturing as the influx of high-quality, low-priced manufacturing products began—first from Japan and later from Korea and Taiwan. Simultaneously, the U.S. tax system made it more profitable for companies to fund operations using borrowed money than to use retained earnings. Today the U.S., both absolutely and in relative terms, has the lowest rate of savings and capital formation of any industrialized country in the free world.

What role did the acquisitions craze play?

Beginning in the late 1960s, the preoccupation with the money game made it more profitable to create earnings through the acquisition process. This further helped to divert attention from a hands-on, production-oriented process to a preoccupation with the generation of paper profits.

Were East Asian countries immune to acquisition fever and its consequences?

They basically have cultures in which it is extremely difficult to do acquisitions. Moreover, their economies were much more externally oriented than ours at the time. They worked to shield their local industries from acquisition by foreign corporations while focusing on external markets as a means of building up wealth.

How did the governments help?

Each of the East Asian countries devised an industrial policy that enabled the public sector to focus tax benefits, depreciation, R&D, and investment tax credits to those areas of the economy that represented higher-value-added and higher-productivity manufacturing sectors.

So in these countries private and public sectors have worked together.

More than that. The governments of East Asia looked at themselves in the mirror and said, "We don't believe in an ideology that says, Let market forces decide. We believe we can push, nudge, direct, guide, and influence the forces of the market by strategically allocating the tactical tools that we have at our disposal." Contrast that with America's free market and a system that applies tax benefits uniformly across industry sectors.

Q Which U.S. companies would you say have the strength and resources to extend the American century?

A Those in the high-tech sector, as distinguished from companies in the basic industries like steel and automobiles. The high-tech companies are leaner; their organizational structure is flatter. Information flows faster through them. They're more in tune with market forces. They pick up competitive signals from the global marketplace and not primarily from the domestic market. Some examples are IBM, Texas Instruments, Motorola, Hewlett-Packard, and 3M.

Q Are there American companies that have successfully challenged the Pacific-basin countries on their own turf?

A American International Group has had a tremendous success in East Asia. IBM has a strong and historic presence there, as does Citibank on the financial-services side. In manufacturing, 3M, Texas Instruments, and a host of others.

Q What sets these companies apart?

A They're prepared to stay in for the long haul. Typically, in the case of manufacturers, they have a very high component of their sales dependent upon R&D in order to generate new generations of products. They design their products specifically for local markets, and they often manufacture directly in East Asia, as opposed to manufacturing in the U.S. and simply exporting to these markets.

Q What about their staying power?

A They develop an institutional continuity within their organizations so they can keep track of changes within the governments. You can't do that if you're rotating your staff every couple of years, as is generally the case with American firms. Nor can you do that if you're exporting from the U.S. But staying power requires a hell of a lot of financial resources.

Q Should we emulate the East Asian system?

A A lot of analysts argue that we should. They say, "Well, we need a department of international trade and industry modeled on what the Japanese have done" or "We need an industrial policy-formulation process within the government to counter the tactics that the Japanese use."

But Japan, Korea, and the Little Dragons have authoritarian, rigid governments and homogeneous cultures, so it's relatively quick and easy to impose a system on these cultures and ensure its success.

Q What should we do instead?

A We need to look at the formulation of incentives. They are a very American way of dealing with these problems and of making ourselves strong in competing with the East Asian system.

Q For example?

A One approach would be to build the process of disaggregation into a tax code. The process would come about as a result of a consensus between government and business. With disaggregation, for example, it would be clear that computers, telecommunications, and semiconductor manufacturing—because they face a higher degree of competition—need more aggressive R&D credits, a higher investment tax credit, and perhaps more aggressive depreciation benefits than, by comparison, real estate and agriculture. So we could use incentives to bolster these sectors, which are critical in competing against East Asia.

What do you see as America's chief strengths going into the next century?

An uncompromising commitment to representative democracy; an incredibly diverse and resilient society that is capable of unmatched entrepreneurial energy; vitality and skill; a market second to none in responsiveness, flexibility, and size; unparalleled inventiveness; and a dynamic ethnic heterogeneity.

With the demise of Communism and the world at relative peace, America now has a window of opportunity. Not to take advantage of it may be to miss the best chance this nation has had in a generation to put its house in order in anticipation of greater challenges to come.

Q In the meantime, what needs to be done?

A Without adequate incentives to strengthen the manufacturing sector, we're going to continue to get battered in terms of global competition. Without higher-quality, better-trained workers in the production process, we're going to be at a disadvantage against East Asian competitors. And without the emotional stability of the family, we're going to be unable to produce the kids that will be able to compete successfully in a more competitive educational system and then move into industry.

Q What can senior management specifically do to help get American industry back on track?

A In recent months, we seem as a nation to have been sidetracked by secondary concerns, such as flag burning or the fiasco in Panama. Somehow we're ignoring what's really important to us.

CEOs can take the initiative in raising the level of public debate on key issues and keeping them in focus. They can do this by going through such organizations as the Business Roundtable, the National Association of Manufacturers, and other vehicles, or speaking out on their own.

We have to ensure that concerns about reducing the deficit, increasing levels of capital formation, and bolstering our manufacturing capabilities remain at the top of the national agenda, because these are the issues that are going to determine our future. ■

Senator Levin. Carl Brown, vice president and COO of Nicholas Plastics.

Mr. Brown. Good morning, Senator.

Senator Levin. Thank you for coming.

Mr. Brown. Thank you for the invitation.

STATEMENT OF CARL R. BROWN, VICE PRESIDENT AND COO, NICHOLAS PLASTICS, GRAND RAPIDS, MI

Mr. Brown. Sitting here listening to the other panel members I find we all have the same problems. Let me tell you a little bit about Nicholas Plastics.

We are a small company. Our business is providing profile extrusions of Thermoplastic materials to the automotive and to the office furniture industries. We employ less than 300 people in the company, and the markets that we serve, as you've already heard from my other panel members, are very competitive. The automotive industry, particularly, is not allowing price increases, even though we experience cost increases. We see ourselves as having to continuously improve for survival. We hear a lot of talk among the larger corporations and among our customers about continuous improvement for enhancing profitability and other items to make us better, but we view it, as a small company, being a matter of survival.

Two obstacles that I chose to talk about this morning, very similar to those that have already been discussed: 1, education of the workforce, and, 2, the obstacles that we face in our survival battle of justifying capital expenditures. Not necessarily getting the money, but with our smaller base we have to keep pace with large corporations and so we have to spread capital dollars over fewer sales versus our competitors.

First, to speak about education in the workforce, we find, in our company, that we're most successful with technical innovations which require lower levels of technical reasoning on the part of our employees. By this we mean change with relatively simple tasks, because the employees are coming to us ill prepared and training is a major effort on our part. We spend considerable monies training employees. The types of things that we do include on-the-job training, classroom training for employees coming into our company, and we are training people in reading, comprehension, math, simple measurements, and then reasoning. These skills are mandatory in manufacturing today. We no longer have the types of jobs and equipment in which we can just put a person into a factory and have them function with a short period of training.

We also find, as we've introduced computer-aided design and other computer automation systems into our factories, that we have to do the training ourselves as well as go out to special schools to train our employees, because the employees that come to us are not computer literate, and so we start from the ground level to do our own training and development of our people and, then, like my other panel members, we tend to lose those people and so we are continually going through that program with employees.

We have, as a part of our company, a subsidiary, Vi-Chem Corp., which is involved in the compounding and mixing of polyvinylchloride materials for the automotive industry. And there we have a completely automated mixing facility which is computer-operated. We have, in order to keep that equipment running and to control our manufacturing operations, continual training of the employees that are coming to us, and that represents a significant burden as we are doing what we perceive should have been done by the school systems.

Other areas of a more specific nature in our business is that we don't have the ability to hire employees who already have been educated to become laboratory technicians or color technicians or designers. We find ourselves having to hire people and then do that training ourselves and it represents a significant burden to the company.

In addition to doing internal training, we at Nicholas Plastics have been involved in using the Michigan Modernization Service to train employees. Our use of this service has involved training employees in the use of statistics, statistical analysis, and SPC techniques for use in the manufacturing setting. We also participate with the local colleges and trade schools to send our employees for adult education courses as well as college credit courses, and we participate with RTI in the development of systems to aid us in design and simplifying the work environment. And more recently we have gotten involved in the Tech Prep Program, which I believe you had a view of this morning. We believe that kind of program will be very significant in moving us forward in this area.

So from the education standpoint, while we're not educators, we find ourselves taking on the task of educating our workforce and preparing them to work in today's factory, in today's business environment.

In regards to capital and capital expenditures, we find not the availability of capital dollars to be our most significant issue but we are expected to purchase and put in place the same levels of technology as our larger competitors in areas of quality and in areas of productivity. As you may or may not know, in the automotive as well as in the office furniture industry, they are not just looking for a supplier, they are looking for suppliers who demonstrate the concept of continuous improvement, and we're rated one against the other. A small company gets no special privilege there. We are compared on equal footing with our larger competitors. Thus, if a larger competitor invests in a special quality device, maybe it will be a computerized on-line process control system, and we are expected to do the same or, in my words, we get demerits, we're not considered to be as good a supplier, and thus we're threatened by saying, Well, if you can't do it, others can, we'll go elsewhere. And this is why we see this as a matter of survival and, as a result, we find ourselves investing more and more money to keep up rather than to move ahead, and we believe that this represents a significant burden and handicap for the small business, not only ourselves but others as well.

In terms of what do we feel Congress and yourself might do to help these situations, in the area of education we believe that there needs to be a stronger leadership on the part of the Federal Government in preparing our youth today to work in the business world. I'm not saying and I'm not here equipped to discuss whether we need to spend more money or less money, but our sense of direction of what we are doing within our school systems needs some adjustment or we, in the business world, are going to be in dire straits as we move forward.

We believe that there should be more training in basic skills. I sometimes feel very down, if I can use that phrase, because we get people coming into the workforce today who don't have that ability to reason and to think, and that's scary and we need to change that. We also need to be focusing on technical preparation of our young people, preparing them to go out and to become designers, preparing them to be technicians in laboratories, preparing them to be color technologists. These are the types of functions that are very necessary in today's business. They don't require 4 years of college and, let's face it, most of our youth don't get 4 years of college and so we leave them ill equipped to survive today.

So we're asking for a stronger leadership here in moving Western Michigan as well as the rest of the country in a different direction.

Second, we believe that, and would like to suggest that, some consideration be given to providing a means for the small business to do something other than just work for survival in the matter of capital expenditures. This keeping up with large corporations is, as I said earlier, a significant drain to the company and we don't believe ourselves to be unique. We think that somehow there needs to be some consideration for tax incentives or for low-cost loans or some means of the small company being able to make these mandatory investments without it taking everything we have just to survive. Give us the opportunity to do more innovative things for growth as well. Thank you very much.

[The prepared statement of Mr. Brown follows:]

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the kind of businesses that are here today that are going to provide them a career long employment if they so choose, and give them the kind of wage that's going to make them economically able to support themselves and their family and become a contributing member of our society as opposed to someone on the other side of the equation.

Just in summary, Grand Rapids Junior College is very pleased to be involved in providing services to business and industry. We look forward to some additional leadership.

There are a couple of organizations that might provide opportunity for investment, I want to bring to your attention. The Mid-America Group, which is a broad based group of community colleges, primarily three States; there's the National Coalition of Advanced Technology Centers, there are 52, at last count, organizations that are very much like the Applied Technology Center being built here in Grand Rapids.

The partnership between Ferris State University and Grand Rapids Junior College is nationally unique. We're proud of that. We get many questions of how did we do it, how could you folks ever learn to get along, and I think the thing that's made that possible is that both of us are focused on delivering to the needs of business and industry, that we are both dedicated to serving.

And then a newly formed or being formed group, the Community College Association for Technology Transfer. There are 16 community colleges from, I think, five different States, Iowa, Illinois, Ohio, Michigan, and Indiana that have come together to try and collectively bring to the attention of the Federal Government the opportunity for investment.

We are involved in delivery of technology transfer and education to business and industry and, as we've had the opportunity to discuss over the time, that all are faced with the same problem of acquisition of technology, of equipment. It's a very difficult challenge that we face and I think that perhaps there is a Federal role there.

The comments John Cleveland made about the amount of Federal investment in research and development, and we certainly understand the value of that and the necessity of that, but an equal investment in the delivery of technology transfer training and education may pay some benefits. Because we're seeing that there is a great deal of technology available. Businesses are having a difficult time taking full advantage of it, and with that I thank you.

Senator LEVIN. Thank you, Mr. Shroll.

[The prepared statement of Mr. Shroll follows:]

NICHOLAS
PLASTICS INCORPORATED

December 18, 1989

Statement By: Carl R. Brown
Executive Vice-President and Chief Operating Officer
Nicholas Plastics, Inc.

Reference: Hearing On Obstacles To Implementation
Of Technology
Senator Carl Levin
Chairman, Subcommittee on Innovation, Technology and Productivity

Location: L.V. Ebehard Center
301 West Fulton
Grand Rapids, MI 49504

At Nicholas Plastics, Inc., our business is providing profile extrusions of Thermoplastic materials for the Automotive and Office Furniture Industries. We are a small company with employment of less than 300 people. Our industry (plastics), and the market places that we serve, is highly competitive and rapidly changing. Thus, continuous improvement is mandatory for survival.

As a small business, we are continually challenged to keep pace with large corporations while bringing our own innovation to market. In doing so, major obstacles include education of our work force and justification of capital expenditures with our lower volume base.

We are most successful in introducing new technology when the equipment or process requires low levels of technical reasoning to operate. That is, we do not need to conduct special education classes when the employee is asked to carry-out simiple tasks. The contrary is true as we experience considerable difficulty in introducing new technology which require our employees to use technical reasoning skills.

In those situations where new equipment and processes which require technical reasoning skills to operate, we must expend considerable time and money to educate our employees. This education process is very difficult as many men and women are coming out of our schools with no preparation for working in todays factories. We are not educators, but find ourselves educating our employees in such areas as reading comprehension, math and reasoning skills.

CUSTOM PLASTIC PROFILE EXTRUSIONS
1134 Freeman S.W. • P.O. Box 1821 • Grand Rapids, Michigan 49501
(616) 247-7882 • Fax (616) 247-1486

In addition to our internal resources, we are using other services to help us overcome this problem:

- Michigan Modernization Service - To train employees in statistical analysis.
- Research of Technology Institute - To do basic research aimed at improving and simplifying the engineering design of extrusion tooling.
- Use of colleges - We maintain a program of full company support for employees to take adult education and/or college credit courses at the local colleges and trade schools.

While doing the above, we have also introduced a productivity improvement sharing program, (IMPROSHARE), to motivate employees to improve manufacturing techniques and to change the ways that we work.

In addition to developing higher levels of technical reasoning ability within our employees, as a small business we also incur the problem of justifying capital expenditures over a smaller base. As we have a smaller base volume than our large competiters, it is more difficult for us to get a reasonable payback on the purchase and use of cost saving equipment and/or equipment that will improve our quality. Therefore, we frequently are behind our larger competitors in the introduction of new technology.

In summary, we have spoken of two obstacles in the introduction of new technology into our company. These are:

- Education of the work force. We are graduating men and women from our high schools which are not prepared to work in our factories. Basic skills must be taught by companies such as ourselves.
- Justifying capital expenditures. As a small business, we are handicapped in that it is difficult for us to get a reasonable payback on the purchase of new technology vs. large competitors.

We believe that Congress and other government bodies can help small business by:

- Provide more leadership in educating our young men and women. We must do a better job in preparing them to work in business.
- Provide a mechanism to make it easier for small business to justify purchasing new technology. This mechanism could be specail tax incentives or low cost loans aimed specifically at small business.

Carl R. Brown

Carl R. Brown
Executive Vice-President/COO

CRB/hil

Senator **Levin**. Thank you, Mr. Brown. I think both of you have mentioned tax credits. One of the tax credits which we used to have was the Investment Tax Credit.

Mr. **Brown**. Yes.

Senator **Levin**. That's disappeared now. It disappeared as part of the 1986 tax bill. One of the reasons I voted against that bill was because of the disappearance of that credit, as a matter of fact. The theory of that bill was that the tax code was supposed to be decision neutral, somehow or other we were not supposed to encourage decisions, substantive decisions, through the tax code. Again, that didn't make much sense to me, because there are a lot of things I think we ought to be encouraging or discouraging through the tax code. I didn't buy the philosophy behind it.

The business community said, if I can generalize here, because there were some clear exceptions, "Give us lower rates, wipe out credits and deductions."

Your suggestions about credits, which I'm very sympathetic to because I didn't buy the philosophy behind the 1986 tax bill, tends to run against the grain of that tax reform. Is the reform based on an erroneous philosophy? Is this an exception to the correct philosophy and everybody tends to say there are exceptions or their proposal for modification of the tax code is an exception? What are your thoughts about that? Both of you mentioned tax credits. Let's start you with, Mr. Brown.

Mr. **Brown**. I can speak to that. I believe that tax credits are an important incentive for business to move forward. Blow it? I don't know that I'd use such terms, but very close to it, maybe. OK? It's very difficult, particularly for the small business. We can talk about, you know, you pay taxes after you make a profit, but we're up there fighting for survival and we feel that we're disadvantaged and handicapped in the fact that we spend so much money just to keep up and to maintain a good balance sheet, and so tax credits would be a very significant factor for us.

Mr. **De Fouw**. I don't know if I'm pronouncing this fella's name right, Steven Schlossstein, has written a book, The End of the American Century, on trade wars, and in this he says—they did an interview with him in Business Month in the December issue, and I attached it to my document here that I submitted. He says, The governments of East Asia looked at themselves in a mirror and said, "We don't believe in an ideology that says, 'Let market forces decide.' " We believe we can push, nudge, direct, guide, and influence the forces of the market by strategically allocating the tactical tools that we have at our disposal. Contrast that with America's free market and a system that applies tax benefits uniformly across the total industry sectors. And I think he's got the nut hit right on the head.

I think the American Government can encourage our industries, our people, over all the different areas they want to see us move in, and they can do that with tax credits.

Senator **Levin**. Well, I've got no problem with it. I very strongly believe in what you're saying. I don't know of too many governments that progressed strongly in this area that have not been more involved than ours in shaping, cajoling, helping, partnership, assisting, whatever you want to call it.

As soon as you start using the words you mentioned, though, industrial policy, then you've lost basically a good deal of the American manufacturing or business sector which tends to be opposed to industrial policy. It suggests we are going to pick winners and losers somehow or other out there instead of the market. There was a nice description earlier this morning, a nice description of how Government can be involved in supporting those market decisions rather than making those market decisions, helping with training of firms that are responding to the market or training of people in firms that are responding to those market decisions, but it still comes very close, I'm afraid, to some kind of a strategy.

That's not my fear, but I'm probably in the minority in this. A lot of us aren't scared by that, by having Government as a partnership, but let me just give you an example how far this goes, this antipathy to Government involvement. We had a bill a couple of years ago which Senator Roth of Delaware and I sponsored. It was to create a Department of Trade and Industry. We didn't have a bank which picked winners or losers, all we really did to promote our competitiveness was to have a location in the Government where business, labor, Government, education, could come together and voluntarily devise some strategies for the future to compete in major sectors. It was totally voluntary, as voluntary as you can get. We didn't order anyone to come in. We said, "We are going to encourage each sector where we believe there's going to be some future growth and where we may not be competitive to come in. If they don't want to come in, so be it, but come in and see if we can voluntarily reach some kind of, or have a strategy devised where management is going to say, look, if labor can do this, we can do this, and education is going to say, If you guys can get together, we can contribute this, and Government says, we can get off your back with changes in the antitrust law or changes in the regulatory burden or changes in tax law, whatever it is, to help you folks out, if we can work together." That got nowhere, that bill. Bill Roth, who is as much a free market person as you're going to find in the Senate, and myself, who believes basically in the free market too, got nowhere because it was just labeled industrial strategy, even though there was no mandatory provision to it.

Is the view of the business community, small business or otherwise, shifting at all over the last 5 years when we see what our competitors are doing, do you see any changes? Both of you seem to be comfortable with a greater governmental role. You don't want us to take over, don't want us picking winners and losers, but do you see a greater role for government?

Mr. DE FOUW. I see where we're up against competitors that have had governmental assistance that we don't have or are not capable of getting. I think of even within our United States where we have had the transplants, our Government is set up for new industries, so a new company comes here and they get plans and training and they get a lot of other things that I myself, as an existing foundation company——

Senator LEVIN. Those are usually local governments.

Mr. DE FOUW. I know that, that's not the Federal Government, I'm aware of that, but they are getting really an advantage over us.

Senator LEVIN. Sure.

Mr. DE FOUW. And here is the way that the Federal Government and local governments, MMS, for instance, can really support the existing companies that have been there, not the ones that came in, but the ones that are here and have provided the employment for years and years, the ones that have been giving to the charities and community support, the ones that have been involved in our community and State, help them as well, and give them equal footage.

Senator LEVIN. Do you see a shift at all in the attitude of businesses toward a stronger governmental role so we could compete with governments abroad, Mr. Brown?

Mr. BROWN. I guess my basic opinion is that unless we create an alliance between Government and industry today, the United States, as a value-added producing country, may just die.

Senator LEVIN. But is there a change in attitude, are you reflecting a shift?

Mr. BROWN. I think that's the attitude that's generally accepted in industry.

Senator LEVIN. But the Tax Code, that tax reform bill in 1986 had nothing but opposition from the business community with one or two exceptions. Part of the opposition was based on the philosophy that the Tax Code should somehow or other be neutral relative to decisionmaking. That we shouldn't encourage investments in new technology or buying a home or giving to charity or whatever it is. That there's a philosophical problem in doing that. The business community, I'd say, in 1986, at least, was very supportive of that philosophy in that code.

Is it accurate to say small businesses in this country want a more aggressive Federal governmental role? Our states, like Michigan, are obviously progressive and our local governments are now fighting other local governments, as you point out, giving your new competitors advantages over the established industry, but do you think there's been any change in the attitude of business people toward Government's role in the last year or two?

Mr. BROWN. I think there is. I think it's a slow process. You have, in our country, the basic entrepreneur spirit that stays alive, and it was built on the tenets of you stay out of my affairs and I'll stay out of your affairs, so to speak, but it's changing because the world marketplace is changing and it's gotten much smaller. As we get more technological in the world today, the markets and the space between here and the Asian countries or here and the European countries is changing and we're seeing the alliances take place in other parts of the world where there are the alliances between countries and industries and countries, and I think—at least my perspective is that that is changing and we'll have to change and we will have to do something about it or as a country we're going to be in trouble.

Senator LEVIN. Am I correct in my understanding of both of your testimony that obtaining a skilled workforce or training a skilled workforce is a greater problem for you in terms of adopting new technologies or adapting new technologies than is the capital shortage of buying those technologies? Is that a fair statement?

Mr. BROWN. That's correct.

Mr. DE FOUW. For instance, we've already made that investment in the training of our employees. Now we're looking at small little chunks where we need to fill in now, but as a result of that investment I've seen a tremendous influx of quoting. When I purchased the firm we quoted 5 to 10 jobs a month. We now quote 100 jobs a month. We are turning work away, and that push of growth takes a lot of capital investment to support that new growth. If the purchase orders I have in-house materialize in the sense if their financial planning volumes materialize and they say they are going to produce, they actually do produce, we could see our company double in the next 5 years. That's putting a lot of strain on us.

Senator LEVIN. It's basically there. The capital would be there for that investment, if you have the purchase orders?

Mr. DE FOUW. Yes.

Senator LEVIN. It's there and that's not as great a problem for you in terms of the new technology as getting a trained workforce, either by acquisition or by training inside, and that, I take it, is your testimony too?

Mr. BROWN. That's true.

Mr. DE FOUW. One of the things I'd just inject, I think is appropriate, is that if small firms like ours look at technology like that that's offered as RTI or universities, say that's an extension of our company, for instance, if I were to quote a job and they say, basically, "Can you do stress analysis on this part?" I may not have that capability in our firm, but RTI does or the universities do, and I can quote that and get that work. I can use that as extension of my firm, just as I would for suppliers who do, say, plating or painting. Or if I needed plastic parts I could buy them from my neighbor down the street at Nicholas Plastics. I may not have that capability in-house, but we do a lot of assemblies and put die parts in and plastic parts in. We buy that technology from other companies. We can do the same thing with education, with training, and technology.

Senator LEVIN. Great. Thank you both.

Mr. BROWN. Thank you.

Mr. DE FOUW. Thank you.

Senator LEVIN. Thanks, gentlemen. Our next panel is made up of C.J. Shroll of the Grand Rapids Junior College, and Doug Smith, Director of the Office of Economic Expansion of Grand Valley State University. Mr. Shroll, why don't you proceed.

Mr. SHROLL. Thank you, Senator.

STATEMENT OF C.J. SHROLL, CHIEF ECONOMIC DEVELOPMENT OFFICER, GRAND VALLEY JUNIOR COLLEGE

Mr. SHROLL. We appreciate the opportunity to come before you this morning—this afternoon, I guess we've crossed over, and give some remarks from our viewpoint, and I'll certainly speak for myself, but I think I speak somewhat for the educational community, certainly Grand Rapids Junior College. We work very closely with the local K-12 educational system, technically we're a part of that group, and have been involved in a variety of activities in the community over some time.

Normally I would apologize to you and the group if some of the remarks and comments that I make are redundant of some of those that have previously been made, but if I do that, then I will have accomplished a part of my mission because one of the important things that we've tried to gain and improve, from my view, in the educational system over the last few years is, in fact, to learn some of the terminology of the business community to be able to speak in some of the same language so that we both can better understand their needs and better respond to their needs. Hopefully we've made some progress toward that.

I've submitted to you in writing some rather lengthy comments that give some background. I would like to just briefly go through and highlight some points, and I'm certain you have the additional material for future reference.

Senator LEVIN. You're entire statement, like all the statements that we receive, will be made part of our record and will be part of the hearing record, and we appreciate your summarizing.

Mr. SHROLL. Yes, sir, thank you.

Speaking from the view of Grand Rapids Junior College, and myself in my role as chief economic development officer for the college, involved with the Michigan Modernization Service, with the Applied Technology Center, that I'll highlight somewhat later, working as a part of the RTI team, locally and statewide, we believe that if residents of the State of Michigan are going to continue to experience the lifestyle to which they've become accustomed, if additional residents of the State are going to benefit from the same lifestyle, we're going to have to make some changes both in our manufacturing methods and in our educational and training systems.

You've certainly heard from some manufacturing representatives this morning. We're aware and involved with the LAMP study that's been done and a variety of other activity, particularly through the Michigan Modernization Service, that has given us some indication of where things need to go. There are many changes yet to be made in the educational and training system. We'll outline some of them and make a couple of comments relative to that. We hope that the result of our activities, of Grand Rapids Junior College, and the educational system, in general, will help make these businesses more productive and more profitable. We think that's in concert with their language and with their intent. And what we've come to learn, I think, particularly in our role as a community college, is that if the businesses are better off, we in the public sector, in the service sector, the educational system will be better off. They are more able and more willing to invest in us, to work with us, and to allow us the opportunity to help train and educate their workforce.

We've come to realize that manufacturing is the base of the economy, certainly in Michigan, and I think much of the United States. We've heard some comments about what's going on. You certainly are aware, as are many others, of the additional pressures with the changes that are taking place, particularly in European countries, and what that holds for the future will be even much greater competition.

In the MIT study, "Made in America," that was recently published it was pointed out that we've got to deal at the grassroots level in the educational system, back at the 1st through 6th grade, on through the 12th grade, on through community college education, on through 4-year education.

One thing that we also try and keep in perspective is that while we certainly need to make those changes in the educational system for people coming through the educational system, when we take a look at the workforce that's out there. Depending on whose numbers you look at, some 80 or 90 percent of the people that will be working in the year 2000 are already working today. A massive training program must take place for those people that don't have the opportunity to come back and start in 6th grade or don't choose to. And to proceed in that manner we need to address those issues also.

The MIT study concluded basically by saying that this Nation has every chance of entering the 21st Century displaying the same dynamism that characterized our past performance, and so forth.

I've taken the approach, and on behalf of our institution have decided, we need in our mission a plan for the future. We don't really want to take a chance, we think we ought to plan to improve. My comments come back to some of your questions around the issue of industrial policy, around the issue of planning.

There's a variety of terms that get used that mean different things to different people. Continuous improvement, we think, is a term that we hear from the private sector. We've learned to adopt that term at our educational institution. To follow along with that concept that we can't just be comfortable doing what we did some time ago in our training and education programs, we must move forward, they must continually be improved.

Small businesses, in particular, we think, face those challenges. They don't have the in-house education and training expertise, and they shouldn't have. We heard all three of our small business panelists speak about the massive training programs that they must undertake on the part of their company. I for one believe that businesses should have to bear much less of that burden, education and training ought to be much more the responsibility of the public education system, and that the public education system ought to accept that responsibility and work as a partner.

I think there are certainly many ways of doing that, pursuing that, certainly through local efforts, such as with RTI, consolidating those activities, bringing them to bear on the business problems is certainly a beginning. There needs to be much more done.

The involvement in the implementation of Computer Integrated Manufacturing technology, using CIM, which is a very broad term, and many things that were addressed in the LAMP study and RTI findings have indicated that that certainly holds potential for companies, but it also brings additional problems to companies.

We have seen and continue to find much technology in place in companies but not being used. It's been purchased, they've bought it, but it's sitting there, it's not being used or it's being used very unproductively or they in many cases have automated the problems, which is very frustrating to everybody involved.

When you use a very sophisticated computerized system like CAD, to do what would better be characterized as point-to-point mechanical drafting then all they've done is put technology in the place of the skill and work of the draftperson, they've really not increased productivity. We frequently hear from companies, not quite so much today because we've made some progress, but still hear from companies, "Gee, we could do it faster the old way." In many cases that's true, because what they haven't done is brought the necessary education and training along with the technology so people could take full advantage of the technology.

You must do things differently using technology. That certainly is an area that we, in the educational system, must address, how to do those things differently, how to do more problem solving, teamwork, and how does technology factor into that. We need to help address those problems.

In the West Michigan area, let me focus back on that a little bit, and tell you a couple of things, how we see some things going on. We think that many of the training needs locally can be met and are attempting to be met by a broad sector of the educational community, but particularly by Ferris State University and Grand Rapids Junior College.

Something that we've done is to form a partnership between these two institutions to create, build, operate, and deliver to the community the Applied Technology Center, a significant investment on our part, significant investment on the part of the State of Michigan to directly respond to the needs of business and industry, or at least that's our hope, and our plan. Our ability to listen to our business friends, to follow their leadership and guidance, will determine the true outcome of that project.

The State of Michigan has invested $10 million in that project through the JC and through Ferris. Grand Rapids Junior College and the taxpayers of this community have accepted a payback plan that looks at $18 million over the next 20 years that we'll pay back to pay off our investment, and that's just to give us a facility, just to provide the building from which we can deliver the programs that are needed by current and future workers.

One thing, and I'll come back to it, but I mention it in that context because that's where it's important, is the limited—or at least none to us, limited availability of Federal investment in that kind of a project. We think that there's some opportunity for that type of investment and we think that the payback on the investment would be a very positive.

The whole Applied Technology Center, as you've seen, and Dr. Chubb's comments this morning, is a part of the whole family of activities under the Research and Technology Institute attempting to listen to the business community, attempting to coordinate our services to make it not necessary for the small business person, particularly, to learn the difference between a university and a college and a community college and who can do what. You'll hear some comments from my good friend and colleague over several years, Doug Smith, that one of the things we've been working on locally is to try and make the differences between parts of the educational system somewhat more transparent to the business community. They have their own set of acronyms and language, but we ought to learn theirs much more than we ought to be forcing them to learn ours.

We view, and I certainly hope very strongly, that the businesses are our customers. They are the user of our product, the trained and educated people that we provide. Like any good business we ought to be responding to the needs of our customer. I think that we ought to be much more focused on the outcome and performance of the programs that we provide.

We ought to listen very carefully if our customers are telling us that people are not able to perform the task, don't have the proper knowledge when they show up at their place to go to work. Or if we go there and do some customized training for specific needs of their company, we ought to be doing that on the basis that the people will be able to perform the job better when we're done and not just have spent the time in activity.

We think there should be that more focus on programs such as the Michigan Job Opportunity Bank Upgrade program, and the efforts of the Governor's Office of Job Training. You'll hear from my good friend Marty Reesman in a while that they have focused on helping us in the education and training business to better and better benefit the businesses. We're trying to do that.

Another program that I mention as an example is the State program called the Job Training and Retraining Investment Fund Program that has been strongly supported by our local representative Tom Mathieu. We are terribly appreciative of the work that he's done on that. The State, through his efforts, is taking a look at this need for training and education, particularly in community colleges. The Mathieu said, "What the State needed to do was to make an investment in community colleges to enable us to deliver the training and education." I'll come back to that point at the end of my remarks.

There are several paragraphs of reference in my document to the issue of national policy. Whether we call it industrial policy or anything else, it's the kind of thing that we observe and hear about that goes on, particularly in European countries. If you go to the small country of Denmark you see how closely coordinated they are between the government and the education and the private sector, the businesses. I think it isn't viewed as government involvement necessarily, but more so as government leadership, of where are we going, how are we going to get there, and how can we all be going in the same direction.

The State of Michigan, several years ago, I think 3 or 4, came forth and said that they really wanted to see the State of Michigan become the advanced manufacturing center of the world. Governor Blanchard and Doug Ross were very involved. It's been a dramatic help to us out here doing the work with the small businesses such as Gene De Fouw. What it says is, this is where we're going, there is that stake a long ways down the road or out in that field and let's all work toward it. The businesses were working in that direction. The educational training systems were going in that direction. It made it much easier for the State to invest in programs such as the Michigan Modernization Service that would help us move in that direction.

It didn't come as a direction or you must do that, or an overburden, it came really as leadership. My view, and I've been fortunate on a couple of opportunities to look firsthand at some of the European programs, that's the way I view them. I think there's much opportunity for that and certainly in the educational system we would benefit from that leadership. Leadership would make more clear to the educational system where it should be going, who should it be serving, how well should it be doing, and what kinds of measures are we going to use to judge that performance?

Locally we've done the same thing. Locally in Grand Rapids, particularly the efforts of the Right Place Program, and now the Manufacturers Council, and the local area chambers of commerce, has resulted in the Tech Prep Program that you had the opportunity to see this morning. These efforts have provided a linkage between all of the different players, and that type of situation that has made it, once again, possible for us to be involved, I think is an excellent beginning.

The public education fund that Beth Kelly mentioned, the involvement of businesses, even in the elementary grades, to help students begin to understand. One of the critical problems that we face in this community is just the knowledge of students about the jobs that exist. You hear about problems of people finding skilled workers or of any workers at all, but yet there are a great number of people unemployed. If we went and talked to the majority of high school students in this community and said, "What do you want to do?" Most of them would not be able to identify a job. Even when they come to us at the community college they don't know. There isn't the connection. They are not familiar with the jobs that exist.

There's a dramatic shortage in this community in the tool and die trades, particularly. Most people aren't aware what those jobs are, what they involve. The picture that they have in their mind is probably at least 15 years old, if not more, though these are very clean jobs, these are high-tech jobs involving computers, and they are just not aware of what the needs of these industries are.

Our local furniture manufacturing business, very robust, lots of opportunities, very stable business over the years, orders are good, and most people just aren't aware of what exists, so there's a great deal of knowledge that must take place and be transferred and the partnerships will allow that to happen.

Let me just mention the Applied Technology Center a bit more. There's some additional comments and information in the document. As I pointed out earlier, it is a joint project between Ferris State University and Grand Rapids Junior College. We've formed, at a minimum, a 40-year partnership. Our two boards, representing the public interest, have totally and wholeheartedly concurred with this project that we would bring our joint resources together, that together we could do more than we could accomplish individually.

The project is underway, the building is being built, the plan is to have it open in November of next year. We think it's going to be dramatically helpful just by the mere mass and size of it. Now, buildings don't deliver programs and buildings don't accomplish educational training, but it certainly will give us a very attractive and useful facility to do that which is necessary, and it certainly will focus the attention on this and it will demonstrate at least our commitment to doing that.

One of the problems we have with such a project is in the scheme of things it's comparatively or relatively easy for us to fund and construct a building. One of the most difficult problems we have in the educational system is to equip programs. And now to a much greater extent, that is a problem with the turnover in technology, with the change. In a business there's a certain amount of productivity gains from technology, they can finance it against work orders, they get return on that investment. That's not something we have figured out how to do in the educational community. Investment in equipment, provision of equipment, the technology that relates to what's going on in business is a serious problem that we must face.

The primary purpose of the Applied Technology Center is to help business with the awareness of technology, consideration of technology, transfer of that technology, implementation of technology, development and effective use. It's a very broad statement, we understand that, but at least at this point in time, in working with our business partners, those are the areas that they've talked to us about.

And I think the comments of the people that have come before and many other businesses in our community have appropriately led us in that direction. We'll refine somewhat later the specifics.

Grand Rapids Junior College has been active for several years in serving the business world. We are very fortunate that we have had the opportunity to do so. We think that we've brought some things that have been valuable to them and we look forward to doing more in the future.

In the prepared materials there are references and background about the kinds of programs and some examples of what we've done. And I think maybe one thing out of there that I would point to is the linkage that we've built locally between our work with companies in our training for current technology and what we've done with our work funded through the Job Training Partnership Act (JTPA), training dislocated workers, and those people that are older and economically disadvantaged, without jobs and without apparent ability to get jobs and who have suffered some problems in the past. We found that by linking those two efforts together that both have become very much more successful because we think and our feeling, and it's reflected in the response of many of our business friends, is if we're out there helping businesses with their problems and training today, and if we go back and immediately factor that into the training programs we've made some progress toward closing that gap that realistically exists in many cases between what education is providing and what business would really like to receive.

So we think that, once again, some kind of guidance at a national level would be very helpful, that we ought to be doing training, we ought to be providing people with an opportunity to re-enter the workforce or to enter the workforce in the first place, but if it were also focused on the business that has the need, both would be better off. The companies would get workers with the skills and knowledge that they need and the individuals would get the jobs in

Testimony
to the
U.S. Senate Subcommittee
on
Innovation, Technology and Productivity

The Honorable Carl Levin, Chairman

Provided by:

C.J. Shroll
Chief Economic Development Officer
Grand Rapids Junior College
December 19, 1989

The Case for the Productivity of American & Michigan Manufacturing

If residents of the State of Michigan and all of the states of our nation are to continue the life style that we have come to enjoy, we must make changes in our manufacturing methods and the education and training systems that support manufacturing.

In the face of a rapidly changing world economy manufacturing firms in Michigan and America will have to learn how to be more productive and more profitable. Manufacturing is the foundation of the Michigan economy. Only through a healthy manufacturing sector can the rest of the economy prosper. This position was well spelled out in the document Path to Prosperity developed by Doug Ross, former Michigan Department of Commerce Director.

In the recently published MIT study, "Made in America," it was pointed out that restoring U.S. competitiveness demands grassroots changes by companies, schools, and workers. The MIT report points to the vulnerability of the American manufacturing system as the biggest threat to this nation's standard of living and security. The lead sentence in the report read "To live well, a nation must produce well." This MIT report concluded on an optimistic note by saying "this nation has every chance of entering the 21st century displaying the same dynamism that characterized its industrial performance throughout much of the present century."

While we may have a CHANCE of being successful, I for one would rather see us PLAN to improve our performance relative to the rest of the world.

Business must focus on continuous improvement in the form of quality, timeliness of delivery, product development cycles, and competitive pricing. Manufacturing firms must learn to work together on these issues as is being done in Northern Italy and many other parts of the world. The relationship between suppliers and customers must be viewed as an opportunity to work together rather than an adversarial relationship. Similar companies who used to view each other as competitors must learn to form networks and share such things as technology developments, marketing information, and manufacturing capacity.

Firms must move toward having a less specialized workforce that is more involved in the company's welfare. An excellent example of this type of company workforce relationship was described in yesterday's Grand Rapids Press story about Cascade Engineering. Cascade is an excellent example of the potential that manufacturers have through "cooperation, teamwork, corporate culture, and employees personal and professional development." "When the right mix of people, technology, quality, and creative thinking come together," success inevitably follows. The Press article goes on to outline the Cascade approach to workforce involvement and development that could well serve as a blueprint for other manufacturing companies.

As a further demonstration of Cascade's commitment to technology and workforce development, I am pleased to report to you that Fred Keller, President of Cascade Engineering serves as the chairperson of the private sector board of the Applied Technology Center project of Grand Rapids Junior College and Ferris State University.

Challenges Facing Small Business

Small businesses, like all business and industry, must face the rapidly changing world of manufacturing technology, necessary workforce skill and knowledge, and worldwide competition. Unfortunately for small businesses they often lack staff to provide the training, research and development, and implementation needed to deal with these manufacturing and training issues. Fortunately for many small businesses they have formed partnerships with agencies such as Grand Rapids Junior College to help with these issues. There is much more that needs to be done.

It has been clearly demonstrated that the successful deployment of technology to small and medium size businesses is greatly enhanced by a strong complementary program of technology training. Through training firms can become aware of, consider more accurately, plan for adoption, and most importantly successful integrate additional technology into their operation. All these aspects will increase the competitiveness and therefore the financial success of companies who find it necessary or advantageous to adopt programmable automation to compete in a worldwide market.

Focusing on the greater use of technology by existing firms, the issue of training the current and future workforce of those firms is significant. It would be foolhardy for a company to adopt new technology without insuring the availability of skilled workers to operate and use the technology. The current employment situation is such that there is not a ready pool of trained workers, skilled in the use or programmable technology, available to be hired. So whether a company will be expanding and hiring new workers or moving forward with the workforce already employed, training will be necessary in either case.

Most manufacturers that have launched Computer Integrated Manufacturing (CIM) implementation programs have found that the new systems require even higher than expected levels of education and expertise of the workforce. This has been corroborated by the Michigan Modernization Service (MMS) through its work with more than 400 Michigan firms pursuing the deployment of new technology. MMS has found, through intensive interviews and site visits, that the successful implementation of new technologies is dependent on training related to the use and integration of the technology.

It has been observed that maximum results are achieved from the training if it is "customized" to the needs of a particular company. Customized training refers to training that is specifically designed and delivered to a portion of the workforce of a specific company. Customized training also takes into account and is designed to accommodate the specific operating and philosophical conditions of a particular company.

Contrary to early misconceptions that technology would reduce the number of employees in a company replacing workers with robots, experience has shown that firms utilizing technology are among the fastest growing in terms of employment. This is due to increased business as a result of improved productivity and competitive position. What has also been learned from experience is that workers are now doing different jobs. Instead of controlling the machines, they are controlling the computers that are controlling the machines. This means that they need different skills. Training is the only way for current and future employees to gain the necessary skills.

In Michigan the majority of training related to the implementation of new technology is delivered by Michigan's 29 community colleges. Community colleges are working together on this effort through Economic Development and Job Training (EDJT) network. At least one person at each college is designated as the primary contact and manager of customized training. This has made it much easier for businesses to obtain the customized training they need.

In the west Michigan area most of the technology training needs of firms will be met by the combined resources of Grand Rapids Junior College and Ferris State University. GRJC and FSU have formed a nationally unique partnership focused on the technology and training needs of small to medium sized businesses. Both schools now have strong programs addressing these issues. To further their ability to offer services, GRJC and FSU have begun construction of the Applied Technology Center in Grand Rapids which will assist business with the awareness, consideration, deployment, implementation, and successful use of technology. This will result in increased productivity, competitiveness and profitability of area businesses.

To make a project such as the Applied Technology Center project a reality requires significant investment. As a partner in the project, the State of Michigan has committed ten million dollars through FSU and GRJC to this project. Grand Rapids Junior College has committed over eighteen million dollars to the project from its funds. And, most importantly, local business has committed over three million dollars to the project. When finished in the fall of 1990 this facility will offer over 225,000 square feet of space dedicated to the delivery of technology related assistance to business and industry.

This project is part of the family of activities that comprise the Research and Technology Institute (RTI) of west Michigan. RTI has as one of its four thrusts the delivery of technology training. The linkage between technology training and the other thrusts of RTI, namely graduate level engineering, research and technology development, and technology transfer offers a unique opportunity to meet the broadest possible needs of technology related firms.

There should be more federal programs that take the investment approach to solving the workforce and employment issues facing our country. Many foreign countries do much more by comparison than does the U.S. to directly assist their manufacturing firms.

In Michigan the legislature has created and funded the Michigan Job Opportunity Bank - Upgrade program (MJOB-Upgrade) to help fund the cost of highly specialized and customized skill training to assist firms deploying new technology. This is a significant demonstration of the commitment to firms investing in technology. This commitment is based on the understanding that successful use of technology will result in more people working more productively in more jobs. The success in Michigan firms has been outstanding. Several thousand employees of several hundred firms have received customized training related to the implementation of new technology. These firms are clearly among the leaders as measured by growth and increased productivity.

Another outstanding program of the State of Michigan is the Job Training and Retraining Investment Fund. This program was introduced and strongly supported by Representative Tom Mathieu from Grand Rapids. This program provides funds in the form of investment capital to Michigan community colleges to provide necessary resources for community colleges to prepare themselves to provide the training and retraining necessary for the workforce of tomorrow. This has been an extremely successful program and demonstrates the potential of investment type programs.

Issues of National, State and Local Policy

In my humble opinion America is at a distinct disadvantage because of the lack of clearly defined national industrial policy. Our most serious manufacturing competitors have much more clearly defined programs for improving their manufacturing capacity. History supports the conclusion that Japan became a world manufacturing power when national industrial policy was developed. The same thing is taking place now in Denmark, Germany, Sweden, Italy and other European countries.

About three years ago Michigan established the goal to become the "Advanced Manufacturing Center of the World." The establishment of this goal has had dramatic effect progress towards the goal. The goal has given significant guidance to activities of the executive and legislative branches of the government. The goal has served as a common theme around which the departments of Commerce, Labor, and others can form programs, deliver services, and evaluate progress.

The establishment and articulation of similar U.S. policy statements at the federal level would provide much needed guidance. This would be especially true in the areas of education and training for the workforce. Many of America's foreign competitors have well described and effective national programs which are implemented at the local level. While we have some elements of such programs they do not seem to be well focused on improving the manufacturing capability and capacity of American firms. Programs such as the JTPA program and the Perkins Vocational Education program would serve businesses much better if they were guided by national industrial policy and were funded based on the outcomes of the programs rather than just the activity they generate. Businesses have come to realize the work-in-process does not translate to productivity or profitability and having too much is detrimental. Likewise education and training program must learn to concentrate on the throughput and outcomes and not on the level of activity. Activity is not an indicator of eventual outcome.

In the local area our development policy is primarily led by the Right Place program which is closely affiliated with the Chamber of Commerce. The Right Place program is supported and guided by a coalition of private and public organizations and individuals. Five years ago when this program was developed the focus was clearly on the development of the manufacturing community with the assumption that the rest of the economy would benefit in kind. In the subsequent five years the Right Place program can point to more than 25,000 jobs being created in the area with numerous business attraction and location successes. This clear plan for development has been extremely important and effective for the community. This clear plan made it possible to bring together the support and resources necessary to make the Applied Technology Center project a reality.

The Applied Technology Center

The ATC is a joint venture of Grand Rapids Junior College (GRJC) and Ferris State University (FSU).

The ATC will assist and enhance the economic development of the area and the state through the increased and improved use of technology by business and industry, particularly the manufacturing sector. ATC assistance will be focused on the firms which form the foundation of the economic structure.

Successful economic development is defined as "*more people working more productively in more jobs as a result of more business.*" Each area suggested by this definition will be addressed by ATC activities.

The emphasis of ATC activities will be on currently available "off the shelf" technology, of the type currently in use by area firms. Adherence to this will be insured by maintaining an awareness of current "best practice" of area companies.

The use of the term technology includes both hardware technology such as computers and soft technology dealing with process concepts such as statistical process control (SPC) and the structured approach of experimental design. The term technology also applies to the art and skill development in areas such as culinary arts. Technological programs and activities focus on the development of skill and knowledge to provide the means by which material things are produced.

All ATC activities will be mission driven. Activities of the ATC to encourage the deployment of technology will be fully complemented by related training activities.

Technology transfer and training will be the primary core of the programs of the ATC. The ATC representing GRJC and FSU will be the local delivery point of the state-wide Michigan Modernization Service. Therefore the ATC is committed to meeting the functional and operational requirements of the MMS in the areas of customer relations, MMS/TAP activities, field representatives, training specialists, and local management and support. The ATC will provide the best possible space, location, and support for these activities since these activities fit the primary portion of the ATC mission. This will insure MMS clients the full range of direct and corollary support services under one roof.

The programs represented by the ATC will provide services to a mix of small, medium, and large firms in order to fully achieve its mission. However, a significant portion of its services and the majority of its efforts will be allocated to respond to the needs of small and mid size firms. Small size firms are those with less than 100 employees and mid size firms are those with less than 500 employees.

The Applied Technology Center is to be a comprehensive economic development resource dedicated to providing direct assistance to area business and industry designed to help with the: awareness; consideration; transfer; implementation; development; and effective use of current technology.

Assistance with technology will increase the: productivity; competitiveness; and profitability of area businesses.

Through the adoption of improved technology both in the form of hardware and process, business will create a stronger, more economically stable community in Greater Grand Rapids, West Michigan, and all of Michigan.

The ATC should be the major resource for small and medium size businesses needing education and training related to current technology and to provide this training and education to both present and future employees of area firms.

It is recognized that attention must be given to issues specific to particular technology, and equal attention must be given to the management/human resource development issues that will enhance the use of technology and result in greater productivity and employee satisfaction.

As an informed partner of businesses using technology, the ATC will also participate in the development of local, state, and federal policy affecting the use and deployment of technology.

This mission statement says that the ATC's primary purpose is to facilitate and foster economic development in the area by providing human resource development and applied technology education and training to members of area businesses, community organizations and individual members of the community. It also says the ATC's role in economic development is to encourage and assist the use of new technology by business through technology transfer accomplished by hands-on experiences, information exchange and training. Related to this function are activities in support of entrepreneurial firms engaged in the development or enhancement of technology.

The ATC will act as a broker and conduit to assist area businesses to access and receive full benefit from local, state, and federally supported programs designed to help businesses with the deployment and successful use of technology. Finally, the mission recognizes that the successful use of technology involves both human and technical issues, and states that the ATC plans to deal with both issues.

Grand Rapids Junior College Assisting Business and Industry

As part of its broad efforts to reach out and serve the community - *both its people and its businesses* - Grand Rapids Junior College (JC) has made a commitment to serve as a key training and technical assistance source for the area's business and industry. This is accomplished through the College's Office for Economic Development (OED), which has the resources to train both current and future employees to work in state-of-the-art offices, traditional and high-tech manufacturing, as well as service industries.

Many West Michigan businesses and groups already recognize JC as a leader in re-training, upgrading and enriching their workforce to compete locally and globally in a high-tech labor market.

Staff work closely with each company, small or large, to help assess their immediate training needs, as well as future opportunities. Different types of hands-on training are available to meet customer needs, either on-site or at JC's convenient training facilities. Course offerings are constantly changing, depending on new technologies and business and industry demands.

In addition to regular ongoing courses, customized training can be developed for specific companies. The Economic Development business team works with each company to plan the most convenient and effective training possible.

Training efforts are often part of a cooperative effort between other community and governmental agencies, such as the Michigan Employment Security Commission, Job Training Partnership Act, Private Industry Councils, Michigan Rehabilitation Service, economic development agencies, labor organizations, the Departments of Commerce and Labor, and the Governor's Office for Job Training.

JC strives to understand the needs of West Michigan employers and create training programs aimed specifically at those needs. By being responsive, JC will help ensure the availability of a competitive, technically skilled workforce to compete in our global economy.

BACKGROUND

In 1974, JC initiated its Occupational Training Program as a community outreach to business and industry, as well as to changing workforce needs. Courses included Automotive Mechanics and Recreational Vehicle Repair.

The College expanded its community outreach commitment in 1983, when it created the OED. The OED was designed as an umbrella organization including the occupational training program, as well as the new contracted training program initiated by the College in response to business and industry demands. Since then, the OED has added modernization planning, technical assistance, workforce research, and marketing assistance functions.

Since JC's economic development activities began, more than 10,000 people and 1,000 West Michigan businesses have been served through its training and technical assistance programs.

Earlier this year, JC received a $300,000 Michigan Strategic Fund grant to research the manufacturing workforce's training needs and opportunities. Titled the Competitive Workforce Project, the grant supports research efforts by the Michigan Department of Commerce and the Michigan Strategic Fund.

Through helping organizations implement improved technology in both hardware, software and process, the ATC will play a key role in helping businesses create a stronger, more economically stable community, critical in today's global economy.

MODERNIZATION PLANNING

Recognizing the rapidly changing world around them, industries have increasingly decided that they not only need to make investments in new technology and equipment, but in training and process as well.

The OED offers a wide variety of modernization services - from training and technical assistance, to resource linking and technology implementation - all designed to help companies with different aspects of modernization planning.

When contacted by a company, JC responds by providing a field team with training and industrial experience. This team works to identify assistance areas and then custom designs programs to fit each company's specific needs.

One of the key resources in this process is the Michigan Modernization Service (MMS), a state-funded program that provides assistance with market analysis, technology deployment and workforce development to Michigan's small and medium-sized manufacturing firms.

OED houses the offices for MMS's West Michigan operations. MMS links each business with a staff of private consultants that can recommend to its employees how to use new manufacturing technologies and management practices cost-effectively.

During the past four years, MMS has served more than 500 companies state-wide through its services; 66 of those in Kent County alone.

Technology assessments review current manufacturing operations and technologies. Written recommendations are provided on how the company can improve the use of existing technologies and implement new ones.

In addition, the resource team assists with practical acquisition and implementation issues related to specific technologies, assesses training needs and performs trouble-shooting during implementation.

As partners, JC and MMS assist business and industry who are modernizing their facilities, processes, and considering training for their workforce.

COMPETITIVE WORKFORCE PROJECT

The Competitive Workforce Project, in support of efforts by the Michigan Department of Commerce and the Michigan Strategic Fund, is designed to meet the needs of West Michigan's economic base industries and enhance the region's continued economic development.

This three-year research project is a direct response to industries' increased demand for skilled technical workers due to an influx of technological changes in manufacturing.

JC, using a team of industry representatives and training specialists from its OED, is providing the leadership and management for the project.

In addition, Northwestern Michigan College in Traverse City, Muskegon Community College in Muskegon and Lake Michigan College in Benton Harbor are assisting with accomplishment of project goals.

The project is also using available resources from local and intermediate school districts, MMS, the Industrial Technology Institute, Michigan Department of Education, the Research and Technology Institute of West Michigan and Ferris State University.

It will enable community colleges to better understand the needs of employers, create training programs aimed specifically at industry needs, and increase industry awareness of community colleges as training resources.

CLASS SIZE TRAINING

JC's Occupational Training (JCOT) Program offers training courses that focus on the educational and vocational needs of students who wish to gain occupational skills and enhance their employment opportunities. The outcome: more people with more skills working more productively in more jobs.

Classes are conducted at the Occupational Training Center and run eight hours per day, five days per week. Course length varies from 10 to 36 weeks. The training operates as much like private industry and business as possible.

Students accomplish specific training objectives, developed with the help of local advisory committees from business and industry.

Upon completion, job placement assistance is given to students and most are employed at the time of completion. New students are enrolled each month, and training areas include:

- *Auto Body Repair/Industrial Painting*
- *Automotive Mechanics*
- *Building Maintenance Mechanics*
- *Computer Aided Design and Manufacturing*
- *Applied CAD Concepts*
- *Computer Based Office Procedures*
- *Computerized Business Applications*
- *Furniture Manufacturing and Finishing*
- *Welding*

Course offerings are constantly changing, depending on new technologies and needs/interests expressed by business and industry. Instructors are experts in their respective fields, and are highly regarded by local employers.

Occupational Training offers several job possibilities by exposing the student to many jobs within an occupational cluster. Wider job opportunities are provided in a changing labor market. The transferability of the skills learned is increased by placing emphasis on the process of learning a skill and not just the product.

DISLOCATED WORKERS

JC's OED operates the Dislocated Worker Program, serving workers in Kent, Allegan and Ottawa counties. Dislocated workers are those people who are or who will be unemployed due to technological change, plant relocation or work cutbacks.

The program is designed to assist workers with building and redirecting currently existing skills, so they can re-enter the workforce as quickly as possible. Individuals are eligible to apply if they have worked for at least one year, and have been unemployed for one year or less.

OLDER AND ECONOMICALLY DISADVANTAGED WORKERS

The OED also works in partnership with the Senior Employment Program to help persons 55 and older upgrade their skills and learn new skills.

In addition, JCOT is one of 15 contracted training providers for the Grand Rapids Area Employment and Training Council (GRAETC), a division of the Area Community Service Employment and Training Council (ACSET). JCOT provides direct training to eligible clients, many of whom are economically disadvantaged adults and out-of-school youth.

JCOT was one of the largest contractors for GRAETC from July 1, 1988 through June 30, 1989, accounting for about 20 percent of all occupational training enrollments. In total, JCOT trained 418 students in its open entry/open exit programs.

CUSTOMIZED TRAINING

Companies today recognize that to remain competitive, they must keep productivity high. A well-trained workforce is essential toward accomplishing this goal.

Convenient, customized training programs are another part of JC's community commitment. The OED brings together a hand-picked resource team with the necessary training skills and industrial experience to work with each different employer. Team members meet with each company to help identify skill training necessary, and then custom design a program to fit specific needs.

JC continuously expands its training areas, as new training needs are expressed by area business and industry. Instructors are not limited by geographical areas, as they have been requested to train nationwide, as well as in Guam, Manilla and Canada.

One of JC's community outreach functions is to identify the most appropriate financial resources to help fund company training initiatives. Through the OED, companies can be linked with additional local, state and national agencies, government organizations and funding sources to help them meet their specific training needs.

JC has helped companies receive training subsidies through the following programs:

- **Michigan Job Opportunity Bank-Upgrade (MJOB-Upgrade)** - a grant program through the Governor's Office for Job Training, available to small and medium-sized companies implementing new technology who need to upgrade the skills of their present employees.
- **Quik Start** - a grant program through the Michigan Department of Education, which funds educational institutions to develop or enhance

curriculum to meet specific training needs of a company, either in implementing new technology or creating new jobs.

- **Michigan Training Incentive Fund (MTI)** - an interest subsidy program through the Governor's Office for Job Training, to subsidize interest on company loans used to implement a broad range of training.

- **Michigan Business and Industry Training (MBIT)** - a grant program through the Governor's Office for Job Training and the Michigan Department of Commerce, used to support companies expanding or creating new jobs.

TECHNICAL ASSISTANCE

As businesses upgrade their technology, they oftentimes find they need technical assistance to help them implement or trouble-shoot. JC staff provides assistance in technical areas such as Computer Integrated Manufacturing, Computer Aided Design and Manufacturing, Statistical Process Control and Automated Office Systems.

For instance, a flexible manufacturing cell now under construction at a temporary site lent by Rapistan will be housed in the Applied Technology Center after its completion. The cell is a model of Computer Integrated Manufacturing, a flexible system that allows a manufacturing firm to link departments by computer and make a variety of parts with the same equipment, simply by changing the software.

The cell will soon be available as a working model not only for students, but for area manufacturers. The cell can also be used as a CIM training and educational site for the entire workforce of a company.

MARKETING ASSISTANCE

Through its economic development activities, JC has made a commitment to help the area's businesses and industries expand their marketing opportunities. As part of this initiative, the College operates the Kent County Local Procurement Office.

The Procurement Office is funded by state and local government sources and helps small businesses (less than 500 employees) obtain federal and state government contracts for goods and services.

During 1988-89, approximately 20 Kent County companies directly benefitted from this assistance and received an estimated $10 million in federal and state government contracts.

A full-time staff provides assistance with all phases of contract procurement: bid notices, government specifications, reference materials, bid preparation and completion, and general information on handling government business.

PARTNERSHIPS

Throughout the years, JC has developed cooperative working relationships with many established professional organizations in West Michigan, such as the Society of Manufacturing Engineers, American Institute of Architects, Educational Society of Skilled Trades, and so on.

As part of this cooperative effort, the College's new Applied Technology Center will provide space and support services to more than 20 of these groups. By providing this support, the ATC will help organizations like these by bringing them together in a common setting and addressing issues pertinent to more than one group and the community as a whole.

Another partnership is with computer giant IBM, who announced last fall it was joining the ATC partnership between JC and FSU.

IBM is providing computer hardware, software and technical assistance worth an estimated $835,000 to help teach computer-integrated manufacturing at the ATC. In return, the ATC will offer CIM education, training and demonstration facilities.

SUMMARY

As businesses upgrade their technology, they will also have to upgrade the education of their people, both by reschooling existing employees and by hiring from a pool of trained people.

More partnerships will form, as education and business realize the increasing need to work cooperatively to address training and education issues in a drastically changing workforce.

The competitive edge for businesses competing in a global economy will increasingly be determined by the ability of the workforce to respond to what may be rapid and unpredictable changes in technology and products in the future.

JC's community outreach efforts have already provided a beginning training ground for skilled technology workers.

JC will continue to play a significant role in decreasing the discrepancies between West Michigan's industries and the current and future workforce.

JC will meet the challenge to be the driving force for worker training and re-training, as business and industry seeks to develop a workforce for the next century.

Opportunities for Federal Assistance

In addition to direct assistance, there are three broad organizations I would like to bring to your attention that my be appropriate for federal involvement. All are built around the focus of assisting business with technology and training. These organization are: The Mid-America Group, The National Coalition of Advanced Technology Centers (NCATC), and the Community College Association for Technology Transfer. Both the Mid-America Group and the NCATC are broad based and serve on-going roles with their member organizaitons.

The CCATT was formed within the last year by 20 midwest community colleges, all of whom have technology transfer as a primary part of their mission. It is hoped that by forming such a coalition the colleges can collectively attract additional national investment to enable them to better serve manufacturing businesses faced with the challenges and opportunities of associated with modernizing through new technology.

Senator LEVIN. Doug Smith.

Mr. SMITH. Thank you, Senator.

Senator LEVIN. Thank you for your patience. Mr. Smith is the director of economic expansion of Grand Valley State University. We welcome you.

Mr. SMITH. Thank you.

STATEMENT OF DOUGLAS J. SMITH, DIRECTOR, OFFICE FOR ECONOMIC EXPANSION, GRAND VALLEY STATE UNIVERSITY

Mr. SMITH. As an officer of the university I would like to welcome you and members of your staff to our building and our community. We are pleased to have you here and delighted to have the opportunity to testify before the Committee. On this particular subject, and I want to share some comments and observations. I've been with Grand Valley State University 6 years; and came here from working in State government for 14 years. The few things, hopefully, that I've modestly contributed to the community here could not have happened if I hadn't had the partnership of C.J. Shroll in the junior college and the partnership that occurs between the colleges here in this area.

I think there is a unique blend of willingness to try to, in a sense, dirty our laundry together and then figure out how best to serve the business communities. They don't care who or where they get served, they just need to get served. Understanding that attitude has done us well in terms of allowing us to take on some opportunities and change move on to get things done.

I'd like to take just a few minutes, as director of the Office of Economic Expansion, to identify the kinds of resources we bring to the table that complement what you've heard from the Applied Technology Center. Our mission deals more in the general economic development area, working with the local chambers, and working with efforts to coordinate groups. In terms of company specific training, it has to do more with management and consulting types of services than technical training, and there's some observations I'd like to make relevant to that assistance.

I'm very optimistic about the future of this country, certainly about the future of Grand Rapids, but I'm going to make some very pointed comments that come from the experience of working with many companies over the last several years, year in and year out, about the challenges that we face in terms of both the economic development effort and the effort we have in education to be a true partner with business. It starts by cleaning out our own house, if you will, and, finally, some observations about the stage of that modernization, particularly in the small- and medium-sized companies, that have, say, 50 employees or less. These are many of the companies that I deal with on a daily basis.

First I'd make some general comments about local economic development efforts. I think they've taken on renewed importance and a new direction because of two things. Today's technology allows companies to have greater locational flexibility. That technology has allowed communities greater influence in local economic development.

As an economic developer 10 years ago if you talked about economic growth and trying to help steer it or manipulate it or direct it or whatever, it was kind of seen as unalterable act of God, it just occurred. Some communities were blessed with it and others weren't. I think today it's seen that we do have an ability to affect our community's economic growth.

What are the tools that we can use to do that? And if, in fact, we have the ability to affect our growth, we have some obligations that go along with that. That is, to find activities that are not just sustainable economic activities, but also ones that don't just appease environmental concerns, but are ones that contribute to the long-term environmental health of the community and this country.

So I think the attitudinal change that we have an ability to influence that economic growth is not, you know, a small change in terms of the demeanor of a community or the sense of obligation. We have to work with business and industry and together make common progress.

The traditional roles that educational institutions have played are known to most people, economic research, employee training, basic and applied research, and human resource development.

I think some of the newer roles, if you look around colleges in this area, as well as around the country, fall into being catalysts for regional economic growth and cooperation, teaching entrepreneurship, providing technical assistance, the things you've heard from C.J., transferring technology and establishing incubators—that haven't really been mentioned here, but that's another way the public and private sector can cooperate.

Today's technology and societal changes really imply a dramatic change in how educational institutions will operate in the future and I think no single element of that is more important in terms of restructuring higher education than the bridge between business and industry and the community and the educational institutions.

That bridge, and C.J. has talked a lot about it, I think, and, unfortunately, with some of the old mindsets that bridge will not diminish the independence of the university, what it will do is increase our ability to really be interdependent with the communities we reside in and take advantage of the kinds of resources that are there. You've heard and seen firsthand the laboratory that business and industry provides to the educational settings. We need to take more advantage of that and build that bridge so that it is a healthy and strong bridge.

Let me digress for just a moment because it's a mindset that I want to offer that I think is very, very important.

As an economist, and a political scientist, I have, in my short lifetime, never been in a more exhilarating period, and it has to do with the following, what's going on in Prague, what's going on in East Berlin, what's going on in Moscow right now.

The unthinkable is happening on a daily basis. What it's doing is, for the first name in my lifetime, is that what is happening in the world of the political and social science is rivaling that of what has happened to our brethren in the natural and physical sciences.

Gene splitting and atom splitting are very, very important, but for the first time we've got some things occurring that stir the imagination in the human sciences. In facing the tasks before us, nothing is unthinkable if you've lived through the last 3 months in this world. And in the end I think civilization's real advancement will come not from the gene splitting or the atom splitting but from the freeing of the human spirit, and we will work cooperatively together to achieve goals. That is the kind of setting, the environment in which we can face the challenges we have in this country.

Andrei Sakharov's last comments to his family before he, unfortunately, passed away were, "Let's do battle."

I think the immense opportunity that is before us in the world to create peace, will require of us "to do battle," and it is nothing short of battle.

We have the technology today that exists to transform our manufacturing sector. We have also the knowledge of how we go about learning as individuals, and it's with that information of how we learn that we can transform our educational institutions. We need to do both.

Now, let me take a few minutes and just make some observations about the work we've done and my staff has done in kind of a management assistance role in companies and particularly small companies and some of the reflections of what I think the task is.

On balance you've seen some of our best companies today, but our companies have not really, on balance, adopted sufficient technology to make flexible manufacturing, which has to be the key goal, the standard operating procedure. And that means that in companies quality, customer driven, efficiency, and environmentally responsible operations is what their goal should be. Quality, customer driven, efficient and environmentally responsible operations.

The fault in some of the implementation does not lie in the lack of attempts to apply new technology. Senator, the question you were asking the last two participants about the drastic change in corporate culture gets at the heart of the problem. The need to truly change the corporate culture. I think is not occurring at the local level. Paul Hawken, in a book called, Growing a Business in 1988, stated, "American companies have not yet comprehended that in order for our economy to thrive there will have to be a revolution in how we relate to each other as people, as co-workers, and as customers."

There's a lot of literature out there, there's a lot of dialogue going on and I hope C. J. will comment on this—yet on balance we still have only half a dozen companies doing something dramatic, we have 10,000 companies in Kent County, a little more than that, we have over 1,100 manufacturing companies, and we can identify for you the 20 or 30 that are really out there in the forefront, but as we work day in and day out with the other thousand companies, this is where my remarks are directed at.

Locally the competitive companies that we've found who have been competitive have really had something in common, and it has been the following, it's that they've built that competitiveness out of the knowledge, the skill, and the effort of their people. With training and development they link people's performance, their own employee's performance and commitment to the common vision of what the company wants to do.

American manufacturing has been so slow to react to foreign competition that for many companies the ability to change is now a survival issue, it is not simply a competitive one. Nonmanufacturing and other kinds of companies too, managers and leaders have no choice but to change the way they do business.

I want to refer now to a couple of quotes from the American Society for Training and Development because it reflects what we really have found here in our local community. In an article they did on Gaining the Competitive Edge they concluded that, "In a successful company transformation training plays a vital strategic role. It connects people to the goal of changing the organization. Training is the vehicle for learning to become the new company which will succeed only if the quality of leadership is picked up and exercised by everyone in that company." I'll get back to this point in a moment because I think it's the most critical point.

They further go on and recommend for employers many of the things we've talked about here, including investing at least 2 percent of payroll in training and development. As to educators they recommend there has to be an increased connection between the employers in their community and helping improve the work-related learning that occurs in the classroom. They talk about linking the teaching of academic subjects to practical applications, and I think much more of that has to be done.

Now, let me turn and make a comment about a somewhat unique element in the West Michigan economy, but I think it bears probably further study and certainly some close examination. We have an inordinately large number of privately-held companies and there is a philosophy here that I think drives that, something that we've discovered and looked at and examined over the last year that really wasn't evident to us before in a lot of the small companies that are privately held. There's good news and bad news.

Some of the bad news is that the lack of a board of trustees of outside parties, results in the lack of outside perspective that gives them a lack of global perspective. They read about it, they can talk it, but they really don't understand it. They don't believe it, they don't act on it.

They say, "We're making money right now, Doug, you've got your people in here, we are doing some things, but don't fix it, I mean, because it hasn't been broken, we're making money." But they are going down a track which may be abruptly stopped and they are not challenging their own company to the kind of future that it could possibly have.

Even those that are auto suppliers—that we've probably worked most frequently with—when they talk about automation they talk about "injections," single pieces of equipment or processes. It's the lack of a corporate culture. They do it only to the extent the OEM is requiring it. They really haven't made a transformation of their companies.

The good news is that where we've gone in and dealt with the partnership, bringing management and training and assistance together, because they are small privately-held companies they are leaner, they have less bureaucracy than the large public companies, and they can change very, very rapidly. I think that's what's the basis of the great hopes I have for the companies here as we go through further significant changes in the economic growth of our companies.

When we looked back at the training programs and did an assessment over the last 5 years, we noted some things that really were not apparent until we sat down and looked at them carefully. The majority of training 5 years ago was really set up outside the company, it wasn't done on-site. Certainly 8, 9 years ago what was in vogue was to send all your employees someplace else, get them trained, get them into a quiet atmosphere and bring them back.

What happens now is there's a real demand for on-site training, almost a reversal of 5, 6 years ago. Of the training, technical training, 80 percent is done on-site. What I would point out is we go in and do the training and set it up. The first meeting we have there may be a manager there, there may be some upper level supervisors. That's the last time we saw them, and it's the last time the employees saw them in the training session. They send their management team to several different programs to other locations to be trained. What's not occurring is concerted activities that include managers and trainees together going there and changing the corporate culture, really involving the workers in the workforce in all levels of decisionmaking, and in changing that corporate culture, that's what we're not seeing.

The experience that we've had, that Michigan Modernization Service has had and that the literature all identifies is that Americans do not have long term strategies for their businesses. That certainly bears out. There's another side to that when we deal with small companies. Not only do they not have really long term plans, and especially when they are running along successfully, but they also don't know what business they are in. If you're a bus company, you're in the transportation business, not just buses. Our business leaders oftentimes in their own company environments are very myopic and do not see the kind of change in the marketplace that's occurring.

I was involved with the Department of Commerce, and the beginning of Michigan Modernization Service, and what was incredible to me, as we went out with a group of people, including Jack Russell, who was really the brain power behind the whole MMS involvement; we went out and talked with employers in the auto industry; they didn't even know where their final product ended up. They knew they sent it to someone who sent it to someone. In one case when Ford closed a plant in Wayne, MI, and 90-percent of a companies product was now outdated that company did not pay any attention to the announced closing! That scenario you can run time after time after time.

We need to be more educated in what's going on in economic changes and our companies need to be more educated about that.

So that I'll just restate that again. One of the things we are seeing within the training atmosphere that has not changed is you still have hierarchy in the companies in this community, you still have training occurring that's technical training here and management training over here, but what everybody says is if you're really going to go through a corporate cultural change you see something like Cascade Engineering, the lines really are horizontal. I would say that the experiences at most of those companies are still very vertical in terms of the operation of that company and the relationships among the people in that operation.

Finally, or finally on that note too, oftentimes just like C.J. referred to it before, all of us have walked into companies where they've invested in this piece of technology, they have put it in with an old assembly line, and now they've discovered that they had to add labor because it's taken time to take it off the old assembly line to put it on the new machine and then they have to readjust it again to put it back on the old line.

Throwing a piece on training in here, instead of the company sitting down and making plans that are 5 and 6 years long, understanding that's what industries do, training should be driven by a business problem and goal, not simply by a piece of machinery and, unfortunately, I think too often training is driven by a piece of machinery.

Let me turn now to the change facing education. I think our schools have not, on balance, recognized they are no longer the sole or—s-o-l-e or s-o-u-l source of knowledge. The office, the home, and car phone, and even the car have become places of learning. Quality education, information, and training are everywhere. Schools' roles have changed. Here I say schools, I mean everything, K-12 through higher education, but schools fundamentally still have not changed.

The old fear in higher education, I think the worst part is not just sacredness of the classroom, but the old fear that too close a relationship with business and industry compromises the educational enterprise mission to seek knowledge and teaching. And I think it just rings too hollow today, but the attitude is still there. What the educational sector needs at all levels is that the faculty needs to be first the facilitator, rather than the person who stood in front of the classroom before and spoke and sometimes listened and that was the interchange. They need to be a facilitator in the following respects: They need to be able to help students access information, discover and select which of that is relevant information, and then analyze that information.

One of the respondents in the earlier panel said they need to teach critical thinking. There's too much information out there, how do you access it, how do you select what's relevant and how do you take that information and deal with a problem and critically think through the solution? And, finally, they need to be the ones who also teach communication, how do I communicate that to the people who are around my co-workers, people outside the company? They need to be the very best people at teaching the skill of teamwork.

It isn't just the reading or writing and math that we hear from companies that are lacking in our students, it's when a person comes to my company they don't—they lack critical thinking, they lack the ability to work within a team, and we don't teach it in our educational sector.

The faculty as facilitator needs to deal with really teaching and how to manage change, teach entrepreneurship, and finally internationalism really needs to be in all aspects of critical thinking in the curriculum.

I'll return for a second to the business goals in the local community. The global perspective is really needed by companies. There are some reasons why many of them are not getting that global perspective, but they are needed even for those that are not involved in marketing internationally or have any suppliers internationally. It's because they can no longer judge their market position unless they understand the global economy.

Global competitiveness is much more than just producing goods and services that meet the test of international markets and sustain income growth. It is also to create enterprises that cannot just mitigate environmental concerns but contribute to long term economic viability and environmental conditions.

The second goal of business needs to be flexible manufacturing. It's got to be flexible if, in fact, it's customer driven. If changes in technology occur you have to have more flexibility in the manufacturing sector. It requires employee involvement at all levels. It requires statistical process control, and it requires a change in business decisions.

The one final note that I would point to is ASTD, in the document they did on Gaining the Competitive Edge, identified the challenge for education and business is to link the performance of the workforce to the following competitive capabilities, and it's these eight or nine that are in the transcript and that I would repeat very slowly.

This is ASTD now looking at businesses and industry, and they are saying to education and business, this is what's going to have to be required if you're going to be successful: Developing a global perspective, transforming the organization through leadership, fostering innovation, collaborating in nontraditional alliances, serving the customer with quality, producing more with less, integrating technology and human resources, and training and developing employees continually.

I could re-read that list and say that that's also the challenge for educational institutions. It is to develop global perspective and to transform the organization through leadership, innovation. It's, as we talked about between the colleges here in the area and between the colleges and business and industry and other organizations finding new nontraditional alliances. We have got to serve the customer with quality for the educational institution, it's our student. We've got to produce more with less. We're not going to have more and more and more to produce more with. We have got to integrate technology, the computer, in the classroom, and human resources and training and developing our employees has to be a continual effort by us.

Thank you very much for this opportunity.

Senator LEVIN. Thank you so much, Mr. Smith.

[The prepared statement of Mr. Smith follows:]

Senator Levin's Hearing on December 19, 1989
Testimony by Douglas J. Smith, Director
Office for Economic Expansion
Grand Valley State University

Local economic development efforts have taken on new methodology and importance as an internationally competitive world challenges communities' economic survival. Company retention, attraction and business development have become the focus of a growing number of organizations and resource allocations. Today's technology permits business enterprises to have greater locational flexibility and communities' greater influence in local economic growth.

The greater the community capability to control or influence economic activity, the more obligations arise to find economic activities that complement and even enhance the natural environmental and socio-cultural systems. The challenge is to find sustainable economic activities that contribute to the long term quality of life.

Traditional roles that educational institutions have played in economic development include economic research, employee training, basic and applied research, and human resource development.

Newer roles for higher education include serving as catalyst for regional cooperation, teaching entrepreneurship, providing technical assistance, transferring technology and establishing incubators.

Today's technology and societal changes imply a dramatic change in how educational institutions operate in the future. One link that can impact nearly every other function of the institution is the success with which higher education can build an effective and productive bridge between its classrooms and the business and industrial sector. That bridge is not intended to undermine the independence of the university, but rather to increase the interdependence of the university and the community in which it resides.

Let's identify what needs to be done and begin by looking at the environment for change: It is exhilarating to live in these times! Yesterday the unthinkable occurred in East Berlin. This morning the absolutely astonishing was announced in Prague and as we speak the incredible is happening in Bulgaria.

It is about time that what is happening in the world of the social and political scientist begins to rival their colleagues in the natural and physical sciences. Civilization's real advancement will not come with the next atom or gene splitting (as important as these are), it will come with the freeing of the human spirit.

Americans have been fascinated and mesmerized by the San Andres Fault and the possible "big quake" - but no matter how dramatic and even tragic the "big quake" might be - in history it is the tremor of Gdansk, Poland that began the big quake that shook the Marxist "Fault" from Moscow to the Mediterranean that will engulf the 1990s and beyond.

Andrei Sakharov's last words were, "Let's do battle."

The technology exists to transform our manufacturing sector! The knowledge of how people learn exists to transform our schools.

Let's do battle.

Our companies have not on balance adopted sufficient technology to make flexible manufacturing the Standard Operating procedure - quality, customer driven, efficient and environmentally responsible. The fault lies not in just lack of applying new technology but a drastic change in corporate culture including training.

Paul Hawken in Growing a Business, 1988 stated, "American companies have not yet comprehended that in order for our economy to thrive, there will have to be a revolution in how we relate to each other as people, co-workers, and customers."

Locally, the competitive companies invest in their human capital and develop it strategically. They build competitiveness out of the knowledge, skill, and effort of people. With training and development, they link people's performance and commitment to a common vision of what the company intends to be.

American manufacturing has been so slow to react to foreign competition that for many companies the ability to change is now a survival issue rather than a competitive one. In non-manufacturing and other kinds of companies too, managers and leaders have no choice but to change the way they do business.

American Society for Training and Development in "Gaining the Competitive Edge" concludes:

> In a successful company transformation training plays a vital strategic role. It connects people to the goal of changing the organization. Training is the vehicle for learning to become the "new" company which will succeed only if the quality of leadership is picked up and exercised by everyone.

and recommends:

> Employers must use training and employee development to achieve strategic business goals; search out and use the state-of-the art in training and development; train for an adaptable workforce that can make the most of change and manage it for competitive advantage; and invest 2% of payroll in training and development.

> Educators must: increase their connections with employers to help improve work-related learning; hire the best qualified teachers, raise teachers' salaries, and measure the learning that results from their work; link the teaching of academic subjects to practical applications; and help prepare workers for the 10 million new jobs that will be created by the year 2000 and that will require more than basic skills."

Examples:

1. Progress of west Michigan companies
    private vs. public companies

West Michigan has an abundance of privately held companies

- good news and bad news
    - bad news
        - lack board of trustees
        - lack outside perspective
        - lack global perspective
        - they read about it but really don't believe or act on it
        - they say, "we're making money so we must be doing something right and change is not required."
        - even those that are supplier base to auto industry do only what is required by OEM and not more
    - good news
        - companies are leaner, little bureaucracy and so change can be implemented more quickly and effectively

2. Training programs in west Michigan companies

Observation - 5 years ago:

majority of training was employees sent to outside places to "get trained". Now the real demand is for "on site" training but only for technical training. Managers are still sent to several programs for training. What is not occurring is management and employees trained together - building up expectations, understanding and planning together. Our experience, Michigan Modernization Service (MMS) and the literature do not have long-term business strategy.

- too often companies now call workers associates, but it is in name only. Managers do not attend workshops - nothing more dangerous than giving workers new perspective and no new tools or environment in which to use the new perspective.

- Finally, business plans and problems should drive training agendas not just a piece of new equipment. Too often I see new equipment in an old manufacturing line.

3. Challenges facing education
Our schools have not on balance recognized they are no longer the citadels of all knowledge, the sole (or soul) source of knowledge, the office, the home and even the car are now places of learning. Quality information, education and training are everywhere. Schools' roles have changed, but schools fundamentally have not!

The old fear of too close a relationship with business and industry compromising the educational enterprises mission to seek knowledge and teaching just rings very hollow!

Faculty as facilitator
    How to: access information
        select relevant information
        analysis
        communication
Skill of teamwork
Managing change
Teach entrepreneurship
Internationalism in all aspects of critical thinking

Business goals:

1. Global perspective is required even if 100% of market and suppliers are local because you can't adequately assess competition or plan for the future without it, yet most companies only give lip service.

   Global competitiveness is much more than just producing goods and services that meet the test of international markets. It is also to create economic enterprises that can not just mitigate environmental concerns but contribute to long-term economic viability and environmental conditions.

2. Flexible manufacturing critical

   - if customer driven, changes will be required. Robert Reich's "theory of saturation" means U.S. consumer will require more choices - more flexible manufacturing also demanded by export markets - means satisfying different cultural preferences - rapid rate of technology means managing change and volatility in consumer tastes requires more flexible manufacturing.

   - as change in technology occurs

   - requires employee involvement

   - requires SPC

   - changes business decisions

ASTD identifies that the challenge for education and business is to LINK the performance of the workforce to the following competitive capabilities:

- developing a global perspective
- transforming the organization through leadership
- fostering innovation
- collaborating in non-traditional alliances
- serving the customer with quality
- producing more with less
- integrating technology and human resources
- training and developing employees continually.

Senator **Levin**. First Mr. Shroll, you made mention of a couple of national coalitions that I'm interested in. Can you tell me about the National Coalition of Advanced Technology Centers. Can you just tell me where that is located?

Mr. **Shroll**. Right now this group is being coordinated by the Council for Occupational Research and Development out of Waco, TX. It's really a spinoff of the American Association of Community and Junior Colleges and is related to that, and I certainly would be able to provide some more information.

Senator **Levin**. If you would, that would be helpful. And also there is a Community College Association for Technology Training?

Mr. **Shroll**. For technology transfer, yes. That is a very recent effort on the part of, as I mentioned, 16 community colleges, does not yet have an office or a staff. There have been four meetings. It's at the presidential level, the 16 community colleges, we will be coming together again the 21st and 22d of January in Washington. The colleges have submitted individual position papers of what they are faced with, what they are trying to accomplish, and what need they have to get this accomplished. It's been dramatic, the similarity across the five different States that I mentioned and that we think is true across the Nation, the problems being faced and how to address those.

And so the hope is that by building a broader base that many are faced with the same issue when we would come, perhaps, before you or before this Committee with some specific request that you would see that, you know, there is this need that can be addressed broadly, and we certainly will be providing you some information on that group also.

Senator **Levin**. And if you could find out whether or not they might welcome an observer from our Committee or our Subcommittee to that January 20th or 21st meeting, that would be helpful too.

Mr. **Shroll**. I will certainly do that. Thank you.

Senator **Levin**. Chris or somebody else on the Small Business Committee staff might be able to go there and participate in some way or watch, at least, what you're doing.

Mr. **Shroll**. We would welcome that. The group is formed, it's kind of a unique partnership for the 16 different community colleges with nothing other than transfer of technology, small- and medium-sized business, to improve and increase productivity of manufacturing firms is the partnership that they formed. They've put some financial resources, because just doing things like this cost money, and it's very unique, very different. First time our college has ever done anything quite like that, but we see the need and we've learned from our business friends that we need to be able to do more, and the only way we think we can do that is to come together. So we would welcome additional partnerships from you and your Committee.

Senator **Levin**. Is it likely that there would be a legislative agenda coming out of that January meeting?

Mr. **Shroll**. Yes, sir.

Senator **Levin**. I mean a Federal legislative agenda.

Mr. **Shroll**. That is certainly what we're looking toward, either to find out from you and to work with your staff, particularly what is there that's already out there that we might look to that we, just because we're just a little old place over here in West Michigan, may not be aware of or if on the other hand there are some things that we could suggest and agree have mutual benefit to the business community, maybe we could suggest how things you would do in the future might make it easier for us to gain what we need to deliver the services to the businesses.

Senator LEVIN. One of the things which I've been intrigued with today, today's testimony, is there seems to be a much greater emphasis on the need for training of people rather than for capital to purchase technology. I don't know whether we have sampled a cross-section or not, you never know that. From what I've heard there is an emphasis on the need to educate people in how to handle new technology; less of an emphasize, I think, on the need for capital.

The unavailability of capital, for instance, we thought was more of a problem than, perhaps, it is. And that fits exactly with what you folks are about. And it also fits with Government a little better. We've been traditionally not too deeply immersed in the capital business. That fits a more traditional role because it makes life easier too, because it gets away from the industrial policy question and banking and lending to people, how you pick winners and losers, that kind of thing. So in a sense that's a good challenge for us because it fits a more traditional role.

Mr. SMITH. I think in this State, particularly, and probably reflective of other States, 10 years ago there was a very different environment, the major cry was there was not available capital. And we worked with a venture capital group here in the area and we have got a number of different organizations we've set up and some were working 4 or 5 years ago, and today it is really not a significant issue, it's not an issue.

So I think you picked up on something that clearly, from my experience, they are more concerned right now with what technology they have on the floor, the next piece that's coming, and their inability to fully utilize that because of the lack of technical training and the other issues around training.

Senator LEVIN. I think the trick in terms of Federal support for these kinds of efforts is that we be able to identify, probably, an existing program like a Vocational Educational Program or there may be some additional funds next year to try to carve out a piece where there could be support provided for the kind of efforts that we've seen here with colleges and universities and RTI, to try to work through an existing vehicle, possibly. That does take identifying that vehicle, first and foremost, and there are some existing programs which would lend themselves, I think, to either re-emphasis, a shift of emphasis, a targeting of some of the funds, but I would, again, even look possibly to that meeting on the 20th or 21st as a place where that might flow. We'd be happy to work with you on that because that's one of the directions we are going.

Mr. SMITH. One of the requirements that starts a lot of those dynamics in place is, and I think we have done it here voluntarily, if you have three parties at the table cooperating different things will happen. If one of the earmarks for the funds is for a project that includes a community college and 4-year institution working together, you get different dynamics than if it ends up going to just one, and you reward that cooperation. That really hasn't happened at the State or local level until very recently and I think the ATC project is a major one where it really was a reward for the cooperation as well as what effectively was being done.

Mr. SHROLL. Just one short comment. Your letter and communication you asked to address that investment capital, and I tried very carefully with my private sector friends to not characterize that they don't have the need, but if there is a need for investment capital for technology equipment, I'd emphasize, my point is that that's in the public sector side of the equation. In order do the training on equipment enough like that that they are using in business and industry to provide the people to them with the skills and education, we have a hard time raising capital for investment in equipment. It's just a concept that we have no way of dealing with that in the public sector. There's no amortization, no tax benefits. It's a very different equation that we are struggling, admittedly, with.

We can work with the companies and we can find ways to—continually struggle but find ways to fund the ongoing cost of the training, the staff and technology and getting the people there, but having the equipment is proving to be a real challenge. And it used to be in the school business you'd buy equipment and it would last 30 years. Many school systems, we amongst them, have some equipment that's 30 years old. That makes it very difficult to convince businesses or to convince individuals that we're serving that this is like it is out there and that is a real challenge for us.

Senator LEVIN. Before we move on to our next panel, let me introduce Rick Tormala, who is sitting over here, who runs my Grand Rapids office resources, assisted by Paul Troost who's halfway in the back. And they're here; they are good links to me. We've got Chris Miller sitting over here, my subcommittee staff or actually my personal staff, who's handling this hearing today, but the Grand Rapids office is probably the best local link to our Washington office.

Thank you.

The final panel is made up of Martha Reesman, director of the Upgrade Program, Governor's Office for Job Training; and Todd Anuskiewicz, executive vice president, MERRA. Thank you both. You get the award for patience here today. We're going on a little longer than usual, but it's an area which is of real importance to our economic future. We want a good, thorough record for the basis of any legislation we might want to offer. So Miss Reesman.

Ms. REESMAN. The director of the office is an old friend of yours, Joe Forbes, so I guess I should mention that.

Senator LEVIN. Please say hello.

Ms. REESMAN. I will.

STATEMENT OF MARTHA REESMAN, DIRECTOR, UPGRADE PROGRAM, GOVERNOR'S OFFICE FOR JOB TRAINING

Ms. REESMAN. More than half of the jobs created in Michigan between now and the year 2000 will require not only a high school diploma but post-high school education as well. Today, barely one-third of our workers have gone beyond high school, statistics typical of those across the Nation.

By and large we must face the challenge of the future with our current workforce, because more than 80 percent of the current—of the future workforce is the current workforce.

The nexus of our challenge is this: The economic health of Michigan and the Nation, for that matter, depends on convincing workers and employers of the importance of building more skills, improving educational levels, of seeking training. At the same time, we in Government must provide a quality product that people and employers will take advantage of.

Historically, we have not marshalled governmental resources, Federal, State, and local in a comprehensive manner. Programs are organized by funding source in bureaucratic ways that are often incongruent with the needs of the market.

Resources often seem out of sync with demand. Dollars go begging in one program while others don't have enough.

In Michigan there are 70 funding sources operated across nine State departments that fund various types of training.

The State's budget is growing slowly. We can't expect to find large amounts of new money to fill the gaps in the State's coffers. As an example, the State's program, the Upgrade Program, which assists small companies that are adding new technology and need to train their current employees in its use, its funds of $2 million were fully obligated 10 days after the fiscal year began. Applications exceeded funding by more than two to one.

We need to find ways to use our existing resources, both Federal and State, more effectively. State and local agencies need more latitude to ensure that programs meet varying State and local needs.

In Michigan we have begun to turn these 70 fragmented programs and hundreds of agencies into a system that works better to meet customer demands, both individual and employer.

We think that the Federal Government needs to rethink its focus and structure in the same way. Federal assistance has been focused on the education of youth and assisting people who are out of work to re-enter the workforce.

These are programs that are important within the Federal human investment policy, however, creating programs that help keep people employed is also important.

The Job Training Partnership Act, which provides training and placement assistance for the unemployed receives $3.6 billion nationally, $146 million in the State of Michigan.

Many Federal programs such as JTPA are currently in the process of review. Perhaps the scope of JTPA should be expanded to allow funding to train people currently in the workforce who are being placed at risk by technological change in the workplace.

I should also note that research is being conducted by the Office of Technology Assessment and the U.S. Department of Labor specifically on the issue of workplace based training. The efforts to date are promising, however, they still need to be translated into policy and practice.

Michigan, like most States, has sought to fill this void through State-funded workplace based training programs. State-funded training initiatives are generally intended to serve at least one of three functions: Enhancing the ability of existing firms to compete effectively, attracting investments that will generate new jobs, and improving the skills of our workforce.

We, in Michigan, have developed a continuum of company-specific training programs that provide technical assistance, grants, and loan subsidies to our companies. These programs form a unique partnership with the private sector aimed at strengthening our State business.

Michigan has demonstrated its commitment by dramatically increasing its investment in this type of training. Since 1984 general fund support has increased from $1 million to $16 million. Even at this rate we are way behind demand.

We are, in fact, in the process of reviewing our current policies and programs and services to make them more effective. In order to do this we have undertaken a review process that includes research and evaluation of our current offerings and are looking at a range of services that will be of greater benefit to people, companies, and the state.

Other States have responded in a similar fashion. Currently 46 States are funding similar workplace-based training programs to help train the currently employed. As in Michigan, these programs seek to provide economic development and human resource development support that is currently not addressed by Federal programs.

Yesterday I attended a meeting that was organized by the National Governor's Association that had people from several States as well as people from the U.S. Department of Labor and the Office of Technology Assessment. They are looking at ways that the States can work together, compare policies and programs and practices for the future.

None of what I've talked about today can be accomplished without a true partnership between the private sector and Government. The stakes for all of us are too high.

Our strong industrial base in Michigan has served us well in providing high paying jobs for people who are willing to work hard. Modern technology, however, is changing the face of today's jobs. The simple fact is that new technology requires more of workers, not less. It often costs as much to train workers to use new technology as it costs to purchase the technology itself.

We have found that companies often underestimate the changes that new technology brings. We have found that small- and medium-sized manufacturers are the most at risk of disappearing, overwhelmed by technology and change.

Training enables companies to make the maximum use of the most powerful resource in any company, its people. In Michigan, as in many other States, we have begun investing state funds in this mission.

The problem, however, extends beyond the borders of Michigan. Training has become a fact of life for every person in this country, including you and me. We need to send a message that says that education doesn't end at high school or college, that education and training never end.

Historically, national policy and programs have been targeted at training people to get jobs. These programs are important and must continue. However, we also need a policy that addresses the needs of people who are already on the job.

We, in Michigan, feel that we have already made some strides, that we have developed policies and programs that do have an effect.

Thank you very much.

Senator LEVIN. Thank you so much.

[The prepared statement of Ms. Reesman follows:]

Testimony for the U.S. Senate
Subcommittee on Innovation, Technology and Productivity
Grand Rapids, Michigan

19 December 1989

Good Morning. My name is Martha Reesman. I am here representing the Governor's Office for Job Training. Senator Levin, in his letter of invitation, asked that my remarks focus on developing a technically adept workforce through the variety of federal, state and local programs and funding opportunities available and look at what should be available.

In Michigan, significant choices have already been made about how the State feels it should do business with its citizens.

More than half of the jobs created between now and the year 2000 in Michigan will require not only a high school diploma, but post-high school education as well. Today, barely 1/3 of our workers have gone beyond a high school diploma, statistics typical of those across the nation.

By and large, we must face this challenge with our current workforce. More than 80% of the Michigan workforce of the year 2000 is already past high school.

The nexus of our challenge is this: the economic health of Michigan, and the nation for that matter, depends on convincing workers and employers of the importance of building more skills, improving education levels, seeking job training. At the same time, we in government must provide a quality product that people and employers will take advantage of.

Problems with the current environment: we don't make it easy

Historically, we have not marshalled governmental resources, federal, state and local, in a comprehensive manner. In order to tackle a challenge of unprecedented scope we have to do more. Some specific problems:

People and employers can't find services.

- I can't open my local phone book and find a listing for "job training." Thousands of people who want to upgrade their skills don't know how to go about it.
- I don't know who to call for help and they probably don't have any money. Hundreds of employers don't know how to

find services and available services are often underfunded.

Programs are organized by funding source in bureaucratic ways that are often incongruent with the needs of the market.

- Resources often seem out of sync with demand. Dollars go begging in one program while others don't have enough.
- In Michigan we have more than 70 funding sources operated by nine departments of state government. Service delivery is often fragmented, and hard to find.

Resources are limited. The state's budget is growing slowly; we can't expect to find new money to fund an expanded need. The state's program to assist small companies that are adding new technology and need to train their current employees is an excellent example. Its funds, $2 million, were fully obligated ten days after the fiscal year began. Applications exceed funding by more than 2:1.

We need to find ways to use our existing resources, both federal and state, more effectively. States and local agencies need more latitude to ensure that programs meet varying state and local needs.

Developing a policy experiment

As we in Michigan looked at these gaps and challenges, we began to think about turning 70 fragmented funding sources and hundreds of agencies into a system that works to meet customer demands--both individual and employer.

We looked at the two traditional models for managing public resources -- consolidation and coordination -- and found both to be flawed.

What we came to is the concept of INTEGRATION. This means:

- Joint planning among agencies;
- A collaborative, community-wide service delivery model that behaves as a system for the consumer.

We said our system should meet two tests:

- It should be driven by customer demand and policy objectives, not the supply side;
- It should be transparent to the customer. If a company needs help in training its current workforce it should

be able to get assistance from the State not a litany of departments and programmatic acronyms.

Federal Role

We think that the Federal government needs to re-think its focus and structure in the same way. Federal assistance has been focused on the education of youth and assisting people who are out of work to re-enter the workforce.

These are programs that are important within the federal human investment policy; however, creating programs that help keep people employed is also important.

The Job Training Partnership Act, which provides training and placement assistance for the unemployed, receives $3.65 billion nationally; $ 146 million in the state of Michigan.

Many federal programs, such as JTPA, are currently in the process of review. We would like to propose that the scope of JTPA be expanded to allow funding to train people currently in the workforce who are being placed at risk by technological change in the workplace. We would also like to have it become possible for these resources to be provided through employers.

I should also note that research is being conducted by the Office of Technology Assessment and the U.S. Department of Labor specifically on the issue of workplace based training. The efforts to date are promising, however, they need to be translated into policy and practice.

State Role

Michigan's Governor Blanchard has declared "The strategy for building Michigan's economic future must continue to focus on people. For in the new world economy, it is the skills and creativity of the men and women who work in our offices and factories that will determine our ability to keep the jobs we have and secure new ones."

To do this, we are exploring new avenues for government to work with businesses prepare for the future.

Michigan, like most states, has sought to fill this void through state-funded workplace based training programs. State funded training initiatives are generally intended to serve at least one of three functions: 1) enhancing the ability of existing firms to compete effectively; 2) attracting investments that will generate new jobs and 3) improving the skills of our workers.

We have developed a continuum of company-specific training programs that provide technical assistance, grants, and loan subsidies to Michigan-based companies. These programs form a unique partnership with the private sector aimed at strengthening our state -- and national-- competitivenes, and consequently our jobs. business.

Training is a key ingredient of economic development. It costs substantially less to support training and upgrading skills than it does to rebuild a community devastated by unemployment. We think that is one of the reasons that Michigan has been able to go from record unemployment to record employment in six short years, with 616,000 new jobs and over 4.3 million men and women at work, a 16% increase since January, 1983.

In the past, it has been possible for a person to succeed through hard work and self-directed education alone. This will not be the case in the future--workers in the 21st century will not be able to compete by using 20th century skills.

It has become a simple fact that workers will need to receive ongoing training in order to keep pace with the changes in the workplace. People will have to obtain an ever increasing base of knowledge and skills. Companies, particularly small companies, often do not have training departments. Michigan has defined one of its roles as assisting companies in defining their training needs. The type of training that people receive is of great importance. It must have value in the workplace. The private sector must be encouraged to select training that brings both the companies and the workers the greatest benefit.

Michigan has demonstrated its commitment by dramatically increasing its investment in employer-specific training programs. Since 1984, general fund support has increased from $1 million to $16 million. Even at this rate we are way behind demand.

We are in fact in the process of reviewing our current policies, programs, and services to make them more effective. In order to do this we have undertaken a review process that includes research and,evaluation of our current offerings and are looking at a range of services that will be of greater benefit to people, their employers, and the state.

While many workplace-based training initiatives have emerged in the public and private sectors during the past decade, the full range of activity has yet to be fully codified or analyzed. We need to better identify current company training practices, trace the links to strategic planning in firms, examine the governance of the initiatives (especially public-private partnerships). There is a need to assess current state supported activities in Michigan relative to initiatives throughout the Great Lakes region.

With such information, we hope to develop a framework that will serve as an effective guide for the development of programs that people want, that companies want and that the State needs.

Other states are responding in a similar fashion. Forty-six states are currently funding workplace based training programs to help train the current workforce. As in Michigan, these programs seek to provide economic development and human resource development support that is currently not addressed by federal programs.

The National Governor's Association is coordinating research and dialogue across the states, allowing states the opportunity to compare policies, programs and practices.

Company Role

None of what I have talked about today can be accomplished without a true partnership between companies and government. The stakes for all of us are too high.

A recent study conducted by MIT's Commission on Industrial productivity notes that: "Greater employee involvement and responsibility will be needed to absorb the new production technologies. Companies will no longer be able to treat employees like cogs in a big impersonal machine. If people are asked to give maximum effort and to accept uncertainty and rapid change, they must be full participants in the enterprise rather than expendable commodities." (Berger... Thurow, Scientific American, June, 1989).

Companies have responsibilities too. They need to face their own needs for training and be willing to support them with resources--dollars. Companies need to integrate training--human resources--into their regular business structure. Training must become a major element in business planning, budgeting and management. It needs to become the last item cut when things get tight, not the first.

Our strong industrial base in Michigan has served us well in providing high paying jobs for people willing to work hard. Modern technology, however, is changing the face of today's jobs. The simple fact is that new technology requires more of workers, not less. It often costs as much to train workers to use new technology as it costs to purchase the technology itself.

We have found that companies often underestimate the changes that new technology brings. We found that small and medium-sized manufacturers were the most at risk of disappearing, overwhelmed by technology and change.

The amount of computer controlled equipment used in manufacturing in Michigan has tripled since 1983. Research suggests that manufacturers continue to add more and more new technology. A company that first adds production planning and inventory control (PPIC) software, often will subsequently adopt statistical process control (SPC), computer numeric controlled (CNC) machines, and computer aided design (CAD).

Conclusion

Training enables companies to make the maximum use of the most powerful resource in any company--its people. In Michigan, as in many other states, we have begun investing state funds in this mission.

The problem, however, extends beyond the borders of Michigan. Training has become a fact of life for every person in this country, including you and me. We need to send a message that says that education doesn't end at high school or college; that education and training never end.

Historically, national policy and programs have been targeted at training people to get jobs. These programs are important and must continue. However, we also need a policy that addresses the needs of people who are already on the job.

We will have to develop programs that work in partnerships with business and industry. We need programs, like those in Michigan, that are nonbureaucratic, simple and easy to access. We want programs that take advantage of existing business systems, such as commercial lending.

This problem is not just a labor problem--it is an issue that affects the entire national economy. We, in Michigan, feel that we have made some strides; that we have developed policies and programs that do have an effect. I thank you for this opportunity to share them with you.

Senator LEVIN. Mr. Anuskiewicz.

STATEMENT OF TODD ANUSKIEWICZ, EXECUTIVE VICE PRESIDENT, MERRA, ANN ARBOR, MI

Mr. ANUSKIEWICZ. Thank you, Senator Levin. I'm delighted to be here today and I'm certainly impressed by the breadth of the testimony, the intelligence, and that everyone has worked so hard here during the holiday season. Being last is an encouragement to be brisk and brief, and I'll try and do that and maybe make it easier because I have one specific request in my testimony today.

I think I come at this activity that we're here for from a somewhat different perspective in that I'm interested and concerned about research and development companies which are kind of the niche of this whole problem of innovation, innovation and technology, so I'd like to make this specific request.

I'd like to suggest a specific model that seems to have worked, and I'd like to briefly describe examples from four small research and development companies in Michigan that are, as we speak, doing some interesting things, and my request of you this morning and in the future is that you consider playing a strong role in the reauthorization of the Small Business Innovation Research Program beyond September 30, 1993, when the current legislation will expire.

As you know, the SBIR Program has been in existence for about the last 10 years, and it s our belief it has played a significant role in fostering innovation and technology both in the country and specifically in Michigan.

As I was considering the Government's role related to technology, and I realize there're lots of difficulty with this general area of industrial policy, and particularly while people at DARPA and other places seem to be willing to play a very aggressive role, others in this current administration are certainly unhappy about those kinds of things.

I heard Hans Mark, who is chancellor of the University of Texas System, someone that's going to play the classic role of joining the Government and going back to industry and the academic area, was a distinguished executive at NASA, then the secretary of the Air Force, he suggested that the aeronautical industry in the United States, which last year had a positive balance of $18 billion, might be a model, and that's obviously very different than most industries. He suggests that the reason is that the Federal Government has really invested strongly in the aeronautical industry for the past 70 years. Also particularly different than many Michigan industries, the Government and the aeronautical industry have avoided an adversarial relationship, they've worked well together. And then thirdly, lastly, that there's been effectively technology, effective technology transfer from R & D to manufacturing because of the close relationship between contractors and customers.

And I feel strongly that this relationship could be profitably employed by others, and particularly the small business community.

Moving on to the SBIR Program and, in Michigan, say that we've received in the State about $40 million since 1982. That's about a hundred, a hundred companies have participated in that program.

And this morning I'd like to just to kind of briefly, further expanded in the written remarks, talk about four small companies that have really been stimulated by the SBIR Program.

The first is a somewhat local company that's in Grand Junction, MI, Duane Snyder, Bluestone Pro-Farms. Snyder developed an innovative technique for a seal for rotary engines. He had many technology-oriented problems raising money, also getting technical credibility in this area. He went to DARPA, brought a model there. They were interested, suggested the SBIR Program. Mr. Snyder prepared some proposals and was recently made an award there. He's now off and running and, with the help of many others, including Western Michigan University here and others of us, hopefully he'll be building a company based on this. And I do not know of any other mechanism that would have helped make that happen.

Second example, a little bit different technical area, but probably somewhat similar type company, rather independent person, and that's Dan Davis of DavisMade. You might be familiar with this company. Mr. Davis' child had cerebral palsy. He was quite concerned about the mobility of this child, you know, as many young children, just a delightful person. He developed an idea for what I can best describe as kind of a vertical wheelchair to add mobility. With lots of people's help he learned about the SBIR Program, worked with GMI, the old General Motors Institute, in the Flint area, put together a proposal to the Department of Health and Human Services and the SBIR Program, received a grant, developed this device, and this past summer I was pleased to participate in kind of the unveiling of a product where he's now selling this device, and again this happened because of the SBIR Program.

Another maybe more mature organization, but was also stimulated in this area, and that's Meridian Instruments, which is in Okemos near Lansing, John Duffendack is president of that company, but they really work closely with the biochemistry department at Michigan State University. John is more a management type. They were interested in developing analytical instruments. Again, they did SBIR proposals, got several awards, phase ones and phase twos, and these awards have played a leading role in both the cooperation of Meridian Instruments with Michigan State University, enabling them to be able to fund research there which then this company has been able to commercialize, and this is now an ongoing company with significant business that, again, was helped in this area, helped to develop technology that's now serving a national need.

Then last and, as you can see, I tried to have some geographic distribution here, is Dan Borodin, whose company, U.S. Automation, is located in the Metropolitan Center for High Technology in downtown Detroit. Mr. Borodin has an innovative special approach toward steel, steel fabrication. As you know, the steel industry is not a particularly innovative area. Mr. Borodin has received several SBIR awards which have enabled him to really develop his special technology, look at all sorts of applications from wires for pollution control devices and coal burning power plants to production of this innovative steel. And, that again is something that I don't think would have happened without this program.

In fact, this was reinforced somewhat because I started talking this morning with a person who runs a company here in the Muskegon area who was very frustrated because he tried to work with TACOM and other organizations of the Federal Government and really didn't receive any response, and I think this is what the SBIR Program is about, and I'm not sure if I convinced him that this would help solve his problem, but I guess I'll know tomorrow or when I get back to my office tonight, but it does offer something significant.

And, Senator, I would hope that, and I guess I'm asking for more than your support, I would hope that possibly you could play a significant role in the reauthorization of SBIR. I think it can provide significant benefits to Michigan.

As you know, MERRA plays an active role in trying to work with this in the State and sometimes we get shot at. You know, California and Massachusetts, as with so many things, get half of the money that goes into this program. I can't fault them for that. Those small companies, they are good. We are trying to make Michigan companies as good and competitive, so I don't think we want to try and redress that, redress that issue, but the SBIR Program is a significant one and has provided significant benefit to Michigan.

And I want to close just with a comment that was apparently made on a similar cold day back in 1933 that Justice Oliver Wendell Holmes suggested to President Elect Franklin Roosevelt. He said, "Young man, you have a choice, but hurry." And I think Michigan has to hurry in these areas. I thank you very much.

Senator LEVIN. Thank you.

[The prepared statement of Mr. Anuskiewicz follows:]

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Summary of the Statement by Todd Anuskiewicz, Executive Vice President, MERRA, at the December 19, 1989 Hearing of the U.S. Senate Small Business Committee, Innovation, Technology and Productivity Subcommittee, Sen. Carl Levin, Chairman, on "Obstacles to Implementation of High Technology by Small Business," hosted by the Research and Technology Institute of Michigan at Grand Rapids, Michigan.

The United States, to prevail in the post-cold war world, must strengthen the long-term health of its economy. Business growth, technological advancement, greater competitiveness, and new jobs are important goals that technology-based small businesses can help the country reach. Reauthorizing the Small Business Innovation Research (SBIR) Program beyond September 30, 1993 is a specific step Congress should take to assist and stimulate small business innovation efforts.

Technological innovation and producing things that people want are the keys to future prosperity. According to Dr. Hans Mark, Chancellor in the University of Texas System, the American aeronautical industry, with a net positive balance in exports of over $18 billion last year, offers a useful model that other segments of the economy can emulate. Dr. Mark contends that the aeronautical industry has kept its competitive edge largely for three reasons: (1) The Federal government has invested in aeronautical technology over 70 years. (2) The government and the aeronautical industry have avoided an adversarial relationship. (3) Effective technology transfer has occurred from R&D to manufacturing due to the close relationship between contractors and customers. This pattern of cooperation and support could be profitably applied by others, and high technology small businesses are a group especially capable of paying substantial dividends through new technology and innovation.

MERRA, as a Michigan partnership of universities, industries, and government, through its small business program has supported small business R&D and helped Michigan firms compete in the SBIR Program. MERRA small business services are supported by the U.S. Small Business Administration and the Michigan Department of Commerce. The latter in 1989 awarded MERRA a $1.5 million contract "to expand the base of small business research, development, and commercialization in Michigan." This emphasis on technology-based small business growth by MERRA and the state is founded on the historical leadership of small businesses as the prime sources of technological innovations, new products, and new jobs. Small firms are noted for their creativity, hospitality for new ideas, and flexibility in tackling risky but promising R&D projects that sometimes achieve breakthroughs. Technology-based small businesses are capable of making the United States a formidable competitor in the emerging technologies if they receive government help.

The SBIR Program has proven an effective and productive way to support small business R&D. Since 1982, Michigan companies have done well in the SBIR Program, receiving over $40 million in R&D funds as part of the $1.7 billion nationally. Among the Michigan firms that have successfully used the SBIR Program to work on important innovations and as a valuable business-building resource are Bluestone Pro-Farms with a new engine, DavisMade with a wheelstand for the handicapped, Meridian Instruments with an analytical instrument used worldwide, and U.S. Automation with the Thermastress Process for stronger steel. These companies and other SBIR winners in Michigan join with MERRA in recommending to Congress the continuation of the SBIR Program so we can continue to make the most of our indispensable small business assets.

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Focusing on Science and Technology for Michigan

Statement by
Todd Anuskiewicz
Executive Vice President, MERRA

At the December 19, 1989 Hearing of
The U.S. Senate Small Business Committee,
The Innovation, Technology and Productivity Subcommittee,
Senator Carl H. Levin of Michigan, Chairman

on

OBSTACLES TO IMPLEMENTATION
OF HIGH TECHNOLOGY BY SMALL BUSINESS

Hosted by the Research and Technology Institute of Western Michigan at Eberhard Center, 301 West Fulton, Grand Rapids, Michigan 49504

Thank you for the opportunity to join in examining the obstacles to implementation of high technology by small business and to offer policy recommendations related to this issue. For the United States to prevail in the post-cold war world, we must strengthen the long-term health, productivity, and global competitiveness of our economy. "Think global" advised Business Week on October 16, 1989 and emphasized the importance of small companies that have "the right products" and that have "mastered the art of export." "Global economic competition is replacing military competition as the key to success in the 1990s," observed Jerry Jasinowski, chief economist for the National Association of Manufacturers, as quoted in the Detroit Free Press, July 9, 1989.

My experience with small businesses in Michigan convinces me that achieving technological advancement, promoting competitiveness, and generating essential new jobs are goals that can be well served by focusing on and nurturing small, technology-based businesses. Small businesses are proven sources of entrepreneurial energy, innovative drive, and employment opportunities.

The Congress must provide the leadership to assure that the Federal government makes the important investments in the future that are necessary for progress. One of these key investments, I believe, is the Small Business Innovation Research (SBIR) Program, established in 1982 by Public Law 97-219, and reauthorized in 1986 until September 30, 1993. The time is approaching for reauthorization of the SBIR Program, and this statement will include reasons why Michigan and the nation need that useful program to continue.

The Lesson of Success by the American Aeronautical Industry

We cannot have prosperity in Michigan unless we make things that people want, unless we develop and deliver "the right products." Flipping hamburgers at McDonald's and similar tasks as part of a "service" economy are not enough. "As technological innovation drives America's economy faster, a more highly skilled work force is required, yet companies are having to spend a fortune on remedial education," Alan Magazine, president of the Council on International Competitiveness, warned recently. We're in trouble, argued Mark Reutter in Sparrows Point, a 1988 study of the American steel industry, when other countries outclass our steel industry and "when more people work for McDonald's than for U.S. Steel."

Today's economic and industrial weather vanes point steadily in one direction, the need to regain national momentum and to reassert technological leadership in crucial areas. The time has come to listen more attentively to a smart tip by Masaru Ibuka, the founder of Sony, soon after World War II: "We shall focus on highly sophisticated technical products that have great usefulness in society."

Answers to our economic, technological, and competitive needs have never been arcane mysteries locked in a top secret vault. We need advanced, innovative research and development. We need trained people. We need modern methods, tools, and facilities. These have been fairly constant needs for at least a century. Consider the following passage by one of America's favorite authors from a book conceived in the Midwest on a lecture tour and first published exactly a century ago on December 10, 1889:

> In various quiet nooks and corners I had the beginnings of all sorts of industries underway—nuclei of future vast factories, the iron and steel missionaries of my future civilization. In these were gathered together the brightest young minds I could find, and I kept agents out raking the country for more, all the time. I was training a crowd of ignorant folk into experts—experts in every sort of handiwork and scientific calling. These nurseries of mine went smoothly and privately along undisturbed...Unsuspected by this dark land, I had the civilization of the 19th century booming under its very nose!...I was turning on my light one-candle-power at a time, and meant to continue to do so.
>
> Mark Twain in
> A Connecticut Yankee in King Arthur's Court

Mark Twain's "Yankee" had an ancestor of our SBIR Program going strong in the sixth century A.D. We must make certain our program for bright minds and expanding, innovative small businesses remains strong through the 1990s and beyond.

Dr. Hans Mark, the Chancellor of the University of Texas System, suggests a model for guidance as we move into the last decade of the century is the American aeronautical industry, which had a net positive balance of more than $18 billion worth of exports last year. American airplanes make up 85 percent of the world's commercial fleet. Why have we been able to maintain a competitive edge in the aeronautical industry while losing it in others? Dr. Mark gives three reasons:

1. The Federal government has consistently invested in the development of aeronautical technology for over 70 years. This program began in 1927 with establishment of the laboratories of the National Advisory Committee for Aeronautics (NACA). The work has been continued by NASA, the NACA's successor. This year we are investing about $2 billion in aeronautical research through NASA and the military. This is a small investment when we consider the return.

2. There is no adversarial relationship between the government and the aeronautical industry. This is extremely important—and not true in many other industries.

3. There is good technology transfer from research and development to manufacturing in the aeronautical industry, as a result of the close relationship between aeronautical contractors and customers, whether in the Federal government or airlines.

How can we apply the lesson of the aeronautical manufacturing industry to others and broaden the benefits for our whole economy? To make this possible, cooperation and mutual support are essential from both the Federal government and from American business. The SBIR Program has become an excellent working example of such symbiotic interaction. In his 1989 book, The Economics of Chaos, On Revitalizing the American Economy, Eliot Janeway wrote, "America's challenge is not just to get even, it's to get ahead again, the American way—by the mobilization of incentives...America's challenge in the 1990s is to use her government to forge the policies indispensable for America to get ahead again as a country: not merely as the market to be exploited, but once again as the power to be reckoned with. Either America will be the power again in the world, or chaos will dominate its politics as well as its economics." The recent historical record makes clear that high technology small businesses through the SBIR Program are contributing to this crusade and can contribute a great deal more.

MERRA Small Business R&D Support Services

MERRA, now in its second decade, is a Michigan partnership of universities, industries, and government. MERRA works with businesses, state institutions, and universities to stimulate research, coordinate R&D projects, assist in obtaining R&D grants, and develop new business opportunities for Michigan.

Michigan in the 1970s and 1980s urgently needed stepped up business diversification, especially in high technology areas, and the creation of more jobs. To assist, MERRA substantially expanded its small business services with particular emphasis on small business R&D projects and greater success for Michigan firms in the SBIR Program. The U.S. Small Business Administration and the Michigan Department of Commerce support MERRA's small business program and services. In 1989, MERRA was awarded a $1.5 million contract by the Michigan Department of Commerce through the Michigan Strategic Fund to "expand the base of small business research, development, and commercialization in Michigan." This ambitious effort shows that the State of Michigan is working harder and investing more than ever before to foster small business R&D and to commercialize the results. MERRA small business activities include:

- Helping small firms expand, accelerate, and strengthen their R&D and productivity through the SBIR Program and other avenues.

- Improving the technology transfer process from university and government research to small businesses.
- Supporting the establishment and working for the success of technology-based small businesses.
- Guiding small businesses in obtaining venture capital, winning SBIR awards and R&D grants, and competing effectively with other states and countries.

A successful Chicago candy store chain once had this motto: "We can't make all the candy in the world, so we just make the best of it." Michigan can't have all the high technology small businesses in the world, but MERRA is trying to help the state have the best of them.

The Importance of Small Business Innovation

Major obstacles to the implementation of high technology by small business include inadequate financial support for small business R&D and the widespread assumption until recent years that only giant firms with vast resources could hope to accomplish superior innovations and take mammoth technological leaps forward. Often exactly the opposite of the giant firm assumption is the case. The SBIR Program is designed to augment small business R&D financial support. A close look at the historical facts concerning innovation results is necessary to combat the illusion that smallness is a liability for inventors and innovators.

Economist Walter Adams, former Michigan State University President, and James W. Brock, pointed out in their 1986 book, The Bigness Complex, that for the 1953-73 period, small firms produced nearly four times as many major innovations per R&D dollar as middle-size firms and 24 times as many as the largest firms. They wrote that while small businesses often can't afford "armies of the best brains" in elaborate laboratories, the available evidence reveals that "small firms and independent inventors are far more efficient innovators than industrial giants." As sources of major inventions, Adams and Brock noted that "small firms are more prolific" and "exert significantly greater research and development effort." A landmark study of invention by John Jewkes, et al., The Sources of Invention, found that over half of the inventions considered the most significant of the 20th century came from small business R&D and independent inventors.

John Gunther once wrote that steel production is "the basic power determinant of any country." Editor and professor Paul Weaver observed in 1988, "In many industries in recent years, bigger has not turned out to be better. In steel today, it is minimills run by a new breed of small, aggressive companies that have the world's lowest costs."

What are some of the strengths and advantages that tend to give small firms an innovative edge? We should identify these small business characteristics to nourish them and to avoid undermining them. Among these critical points are the following:

- Small firms display greater nerve for risky R&D and take more "shoot for the moon" chances on new ideas and new technologies.
- Small firms find it easier to "go for broke" because they have less to lose and more to gain.
- Small firms are more efficient at conceiving and commercializing innovations because they can keep themselves freer of red tape and bureaucratic roadblocks. Business Week once observed that small firms can avoid the lengthy reviews that "often derail innovation."
- Technical creativity and inventiveness often require acts of rebellion against traditional assumptions, rules, and conventions; and intellectual rebels tend to feel less confined and more creative in small firms where "that can't be done" may be heard less frequently. Leaders need "the strength to abandon themselves to the wild ideas of others," wrote Max DePree, Chairman of Herman Miller, Inc., in his 1989 book Leadership Is An Art. "If you want the best things to happen," insisted DePree, "you have to find ways to be hospitable to the unusual person."
- A high technology small business tends to lack old, established products and must rely on successful R&D for survival and growth.
- Small firms are better able to react and maneuver quickly when opportunity knocks. They suffer less from corporate conservatism and lethargy. With smaller bureaucracies to feed, they can keep innovation costs down and carry out more cost-effective R&D. The Wall Street Journal once commented on "the freewheeling entrepreneurial style typical in the high-tech world," and mentioned the small business entrepreneur who had to admit when asked for a five-year plan that "our long-range plan was where we'd have lunch tomorrow."

- Small firms have greater flexibility to scratch failures and start again. They are not attached to the status quo and are less inclined to resist change. "Change is something no one can avoid," wrote Max DePree and warned that change is what many institutions and businesses find particularly difficult to handle. "Anything truly creative results in change," he stated. Thus, creative change becomes a clearcut small business goal.

Talking about technological breakthroughs, Roger B. Smith, as Chairman of General Motors, asked, "Where is all this great stuff coming from? It's coming out of little two- and three-man companies, because they're finding out that 40 guys can't do something that three people can do. It's just the law of human nature." Cultivating small business advantages for effective technological innovation must be a prime objective for Michigan and the nation during the next decade.

Removing Barriers and Helping Small Businesses Innovate

During a period of economic problems and industrial decline, Michigan and other states should, with Federal support, develop fully the economic diversification and job growth potential offered by small businesses. While older, established industries retain their importance, for new jobs and economic diversification, we need to explore other directions. On these fresh horizons, we find technology-oriented small businesses with a commitment to innovation, university research departments helping spinoff small businesses turn ideas into products, and government agencies supporting small business R&D through SBIR and other programs.

Modern industrial history indicates that innovation is frequently the main catalytic force behind the establishment of businesses and the creation of permanent jobs. Recognizing this fact, the 1985 "Long-Term Economic Strategy for Michigan" stressed that "we must create an environment in which industrial innovation is our principal economic advantage." Our need is still the same, and innovative small businesses are still the answer.

The importance of small business contributions to technological advancement and economic growth in Michigan can hardly be overstressed. Many of the state's industrial corporations for several years have been in various stages of reduced growth, stabilization, or shrinkage. These organizations are unlikely to make significant new additions to the state's future job base. To expand Michigan's economy, innovative new businesses are indispensable and must be encouraged. Helping such businesses start and stay alive during their incubation periods will be essential for economic progress during the 1990s in this state and in other sections of the country.

Michigan and the Midwest generally are counting on technology-driven small businesses to generate new jobs and replace those lost as a result of industrial attrition. Various studies have identified a shift in jobs from traditional manufacturing to high technology. Dr. David L. Birch labeled this a shift from hardware to thoughtware. Making certain Michigan is not left behind in thoughtware products and services is something that MERRA and others are trying to assure.

The potential impact of technological changes on Michigan is hardly a new concern. "Studies of the likely effect of technology in terms of new products, processes, and industries should be carried on continuously so that Michigan may share in the new industries that will be of importance a decade or so hence," observed William Haber at The University of Michigan in conjunction with his colleagues at the W.E. Upjohn Institute for Employment Research. Their assessment of the Michigan economy and its future needs was made 30 years ago in 1959. The only thing different today is that the pace of change has stepped up dramatically, and now those who hesitate or play the Hamlet game of indecision are likely to be left behind in the international hard ball game of technological competition. Other countries are not waiting for us to make up our mind about semiconductors, high definition systems, and other strategic and critical technologies. "Those who hesitate, lose" is becoming a global proverb. "A President either is constantly on top of events or, if he hesitates, events will soon be on top of him," said a man who knew about choices and decision making, Harry Truman. Truman, by the way, once asked for a one-armed economist because he was tired of hearing, "on the one hand, this...but on the other hand, that."

A valuable strength of most successful small business entrepreneurs is the ability to make up their minds and act with a minimum of red tape and "on the other handing." As small businesses have shown in other areas, Michigan small businesses also display the entrepreneurial zeal, technical expertise, and innovative boldness necessary for successful high technology developments. Michigan has major research universities to back up and assist small companies, skilled workers and managers, and entrepreneurs rich with ideas. Lacks that Michigan has shared with others is inadequate seed money or R&D funds and insufficient support for expansion and development to compete in the emerging technologies such as computers, biotechnology, automation, artificial intelligence, new materials, and a burgeoning roster of other options.

Insufficient funding for small business R&D is still a formidable obstacle in Michigan and elsewhere. That is one compelling reason for continuing the SBIR Program. Another is the fact that the program delivers. Columnist David Broder recently echoed the common view that "investment incentives would make America more competitive," and he asked why the 101st Congress extended the research-and-development tax credit for only nine months. Yet in spite of difficulties associated with R&D financing, undercapitalization, and related problems, new small businesses continue to appear and to strengthen our economy. "In the 1980s, America saw more new business starts than ever," wrote Eliot Janeway in 1989, "The skilled employees who flew the corporate coop and went on their own as start-up entrepreneurs remained her decisive asset. Skilled entrepreneurs starting on shoestrings, demonstrating the knack of survival...No other country could equal them in numbers, diversity, independence, or success."

Sony's chairman, Akio Morita, in the book he wrote with Shintaro Ishihara, The Japan That Can Say "No", predicts, "It is my feeling that even though times are good in America now and employment is up, the time will never again come when America will regain its strength in industry." We have to prove Akio Morita wrong, and vigorously supporting our high technology small businesses while removing obstacles from their path should be recognized as an essential part of our economic strategy.

Concerted efforts to foster and sustain technology-based small businesses are made in Michigan through government programs, the work of MERRA and others, and increasingly since 1982 through expanding Michigan participation in the SBIR Program. The importance of technological innovation and the outstanding achievements of small businesses as efficient innovators led MERRA in the 1980s to emphasize small business R&D by technology-oriented companies, with particular focus on the SBIR Program and the crucial support and stimuli it provides for small business innovation. Because of the program's ability to serve as a catalyst for technological innovation and its life-sustaining transfusion of R&D funds into qualified small businesses, MERRA advocated and worked for reauthorization of the SBIR Program in 1986. The country's need for SBIR in 1982 and 1986 is greater than ever today. We can safely predict it will be greater still in 1993 when reauthorization of the program is needed again.

Nationally, over 14,000 SBIR awards have been made with a money total in excess of $1.7 billion. Those awards represent direct support for small business innovation that probably would never have occurred without the SBIR Program. The Federal government couldn't have found a better or wiser way to invest its money than in high technology small business R&D. "Small businesses bring new assets and new jobs," wrote Adams and Brock. Sometimes they also bring the breakthrough technologies that launch the human race in new directions and give birth to new industries. "Even if the start-up ventures usually fail," wrote economist Todd Buchholz in his 1989 book, New Ideas from Dead Economists, "just one success story from a garage can spoil the careers of dozens of vice presidents for long-range strategic planning who work in shiny, glass skyscrapers. During the 1970s and 1980s, a clear majority of the new jobs created in the United States were created by companies with fewer than 500 employees."

How the SBIR Program is Benefiting Michigan

The SBIR Program from its inception in 1977 at the National Science Foundation has had the right idea—a productive merging of small businesses, innovation, and R&D, by making R&D funds from major Federal agencies competitively available. The SBIR Program has proven itself a valuable opportunity for Michigan small businesses. Since 1982, approximately 118 technology-based small businesses in Michigan have been awarded over $40 million in R&D funds through the SBIR and the Michigan State Research Fund Programs. The State of Michigan, recognizing the merits of the SBIR Program, has invested over $5 million in small business R&D through the Michigan Strategic Fund and the State Research Fund. The $1.5 million contract received by MERRA in 1989 from the Michigan Strategic Fund to assist Michigan businesses in obtaining R&D contracts and commercializing results is part of this statewide effort. The SBIR Program deserves credit for showing the way and helping stimulate the creation of these and other state programs.

The evidence is plain that many small businesses would not exist today if they had not been recipients of SBIR awards; and other businesses, if they existed, would be substantially reduced without their SBIR achievements. "SBIR provided funding for what is now our main product," said John Duffendack, the President of Meridian Instruments, Inc. in Okemos, Michigan. The SBIR Program has enabled small businesses to carry out high-risk projects and to enter new arenas where investors fear to tread. Virtually all breakthroughs at the beginning from automobiles and airplanes to telephones and xerography and penicillin started as high-risk endeavors and typically were viewed as economically dangerous or worthless innovations. "New entrepreneurial efforts may be willing to take more risks than established companies," wrote Todd Buchholz; and SBIR is assisting with indispensable R&D funding during the vital opening phase (SBIR Phase I) when an innovative idea must be checked out, and in the next phase (SBIR Phase II) when a proven idea must be translated into a useful product or process.

Since the SBIR Program began nationally, MERRA has aided hundreds of Michigan small businesses in setting up R&D projects and preparing SBIR proposals. MERRA, with State of Michigan and Federal backing, assists these small businesses at no charge, thus supplementing their limited staffs and giving them the benefits of MERRA experience in this area. We have learned that many small businesses need considerable encouragement and assistance to try for SBIR awards. Their hesitancy to enter what they fear may be another government paper chase is understandable, and part of our effort is to show them how SBIR is different. With SBIR proposals limited to 25-pages, the program is genuinely competitive and all competitors start with an equal opportunity to communicate the merits of their projects.

SBIR Program results in Michigan have improved steadily, and the program has champions in all sectors of the state. Numerous Michigan participants acknowledge that SBIR awards help keep their businesses going and their R&D work at a level they could not otherwise afford. Michigan winners of SBIR awards are exceptionally varied and diverse in nature, reflecting the program's ability to accommodate all types of small businesses and a broad range of research efforts. The following profiles of representative Michigan SBIR winners demonstrate both the diversity of Michigan participation and the value of the SBIR Program for encouraging technological innovations that might not happen without SBIR support.

The SBIR Program in Michigan has stimulated many additional success stories. Bluestone Pro-Farms, Inc., DavisMade, Inc., Meridian Instruments, Inc., and U.S. Automation illustrate the best features of the program and also some of the problems.

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"SBIR is one of the best opportunities a small business has in the United States or in fact the world," stated Duane Snyder whose company, Bluestone Pro-Farms, has won a Phase I award from DARPA. His project involves seals for a light-weight compact true rotary engine that Snyder has invented and patented. Snyder went to DARPA when his reading suggested that the new engine could serve a number of DARPA needs. DARPA inspected his small working model, thought the idea held promise, and recommended trying for an SBIR award to work on the seals. Snyder prepared and submitted four proposals to Department of Defense recipients and won a priority-rated SBIR contract from DARPA. He is working in collaboration with the Engineering Department at Western Michigan University and reports excellent progress. "I had never heard about SBIR until DARPA told me about it," he said. Now he hopes for Phase II support from DARPA and is readying other SBIR proposals for submission to the U.S. Army, Navy, and DARPA. Concerning the benefits SBIR has brought to his company, Duane Snyder stresses the credibility it has gained for his ideas from others. "SBIR allows new ideas a real chance to develop. I definitely recommend its continuation," he declared. His company goal is to prove his engine for military applications, to begin production for those uses, and to follow up with nonmilitary applications. Duane Snyder was successful with one of his first proposals, and he thinks this is true because his idea was well thought through when he submitted his project. Thus, Bluestone Pro-Farms is a good example of what SBIR is all about—R&D funding that permits a small business to work on an idea that may grow into a product with a potentially wide range of applications.

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DavisMade is rapidly moving toward commercial production and sales of The Standing Dani™, an innovative wheelstand that inventor Dan Davis originally created so his daughter Dani, afflicted with cerebral palsy, could stand and move around. The wheelstand impressed others with its unique features and excellent performance. Davis, then a mechanic for General Motors at Flint, was urged to develop his innovation further. He took steps to obtain a patent, and after hearing about the SBIR Program at a GMI conference, he organized an SBIR project involving two Michigan school districts and bringing GMI and The University of Michigan-Flint together for the first time on a project. Dan Davis and his team won an SBIR Phase I award from the Department of Health and Human Services. The award enabled them to make improvements and to bring the prototype closer to a production design. DavisMade did not need a Phase II award, because the prototype existed and worked, and additional funding was provided by private groups. "The SBIR award opened a lot of doors for us," said Dan Davis, crediting the prestige that accrued from the award with helping his company obtain private grants. His advice concerning the SBIR Program is "Expand it! We need new ideas. New ideas will keep the economy going, and SBIR helps those ideas get going." He stressed the importance of spreading the word about SBIR more broadly so that isolated entrepreneurs and individuals are more likely to learn about the program. "SBIR should do a lot better here in Michigan," he said. He calls his invention a "Michigan innovation" which he intends to make available worldwide. DavisMade is also planning other projects to help the handicapped, including technology transfer projects from GMI. Striving for more SBIR awards is ahead for DavisMade, according to Dan Davis. He called SBIR a wonderful program and expressed doubt that adequate support to produce The Standing Dani would have been found without it. "I expected a lot more controls and red tape in the program. But they pretty much left us alone to get on with the job," he said. He is also proud that his innovation is developing in Michigan. "If you want something done right, you can't beat the Midwest. And for manufacturing, you can't beat Michigan," he said.

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"The status known as 'small business' hopefully is a transient condition for us. Our goal is to become a large business. The SBIR Program is helping us reach that goal by funding innovations that lead to products," observed John Duffendack. He acknowledges that SBIR has been a tremendous help in building Meridian Instruments. The company's chief product today, an analytical instrument now widely used, began life as an SBIR-funded project. Thus SBIR has functioned in classic fashion as a company-building vehicle. Since its startup about six years ago, Meridian Instruments has grown from two to 45 employees, and from zero to $10 million per year in sales. SBIR support was a key factor in giving the company its current product leader, Duffendack commented. The analytical instrument has been on the market about three years and is purchased by research institutes, universities, and industries worldwide. The company's goal is to be a broad-based analytical instrument manufacturer primarily focused on the vast medical and clinical laboratory market. Further use of the SBIR Program is expected with proposals to the National Institutes of Health and other agencies. He expressed the view that continuing the SBIR Program is highly important to Meridian Instruments and other small businesses in high technology fields such as analytical instrumentation. Asked how critical small businesses are as sources of the necessary innovations, Duffendack replied, "Well, the larger businesses weren't doing the job." He suggested that large businesses sell existing products and play it safe, leaving the development and implementation of innovations to small businesses.

While impressed with the general excellence of the SBIR Program, Duffendack identified as a fundamental flaw the excessive time gap between Phase I and Phase II funding. Those who wait for Phase II funding can spend months sitting on their hands, he argued. He noted that a large percentage of projects receive Phase II support when Phase I goals are accomplished. "If you accomplish Phase I goals, maybe one answer would be for the SBIR Program to allow provisional Phase II funding until a Phase II award is approved," he recommended. Even with the problem of bridge funding, SBIR has been an effective catalyst for the company's expansion. "For us, SBIR has been a valuable way to build our business," said John Duffendack.

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Daniel Borodin's company has developed the Thermastress Process for producing desirable changes in the microstructure of steel and other alloys. SBIR awards from the National Science Foundation helped U.S. Automation develop this process into the new Thermastress Miniplant Technology (TMT). In November 1989, Dan Borodin and his company were honored when TMT was inducted into the International Hall of Fame for New Products. Borodin says Phase I and Phase II SBIR awards helped advance the technology to its present status and also served as an invaluable source of recognition and respect. "Before we received our SBIRs, we had difficulty convincing others that our method of increasing steel strength was even possible. The conventional view was that everything that could be known about steel was known. Our SBIR successes helped us break down resistance and gain serious consideration for the Thermastress Process," stated Dan Borodin. While praising the SBIR Program overall, Borodin mentioned that it is sometimes difficult to complete Phase I in the time and with the funds allotted. "A lot of time is necessary when you are working on something that has never existed before. That means Phase I is not always finished on schedule, and it is difficult to accomplish anything ambitious within the framework of the Phase I budget," he said. He advised allowing more leeway in terms of time and money for Phase I. He emphasized that U.S. Automation does not stop work when the SBIR money stops. "We go after results and are committed to do whatever is necessary to complete each project," he declared. Thanks to successful SBIR projects, U.S. Automation is now in Phase III and expects to spin off new companies that will commercialize various extensions of the new technology. Dan Borodin hopes the first such company will be formed in 1990 to use the Thermastress technology for commercial production of superstrength nails, being trademarked as Nu-Nail. Other companies will focus on different market niches, utilizing U.S. Automation technology. U.S. Automation, with equity in each new company, will provide the technology, tools, and technical support. According to Dan Borodin, U.S. Automation has achieved a major advancement in the basic knowledge and production of a much stronger steel in part as a result of SBIR efforts. The company is currently working on Phase I projects for the National Science Foundation and the Strategic Defense Initiative Organization (SDIO). "Both Phase I projects look very promising," he said. He is convinced the recognition small businesses receive from SBIR awards far outstrips the monetary value. "Anything can be improved, but I have great difficulty finding anything bad about the SBIR Program," he said.

KMS Fusion, Inc., a Michigan small business, won over 15 SBIR Phase I grants in the first three years of the program from five different agencies and has won many more SBIR awards since. At the 1989 Winners Conference in Michigan for SBIR and State Research Fund Winners, KMS was honored as a national leader in SBIR competition with nearly 50 awards at that time. Dr. Alexander Class, former President of KMS Fusion, considers the SBIR Program particularly beneficial for small businesses because marketable ideas are methodically advanced from the idea stage to commercialization.

Through its technology-based small business support services, MERRA has coordinated annual R&D Opportunities Conferences in Michigan as well as the 1989 Winners Conference. The R&D Conferences have been sponsored by the Michigan Department of Commerce, the U.S. Small Business Administration, the MERRA Small Business Development Center, the Michigan Congressional Delegation, and other interested groups.

After each R&D Conference, MERRA contacts each small business participant and encourages further action, such as setting up an R&D project and trying to win an SBIR award. This follow-up work is viewed as an important feature of each Conference program. All the Federal agencies with SBIR Programs have regularly participated in these Michigan Conferences. Horace J. Crouch from the Department of Defense at one Conference told Michigan small business representatives, "The SBIR Program is an effective way for Michigan small businesses to bring this state a greater share of R&D funds. We're relying on small businesses to help us innovate." Ritchie Coryell from the National Science Foundation proclaimed SBIR "a national expression of confidence in small businesses." He called the program a productive way "to take advantage of the historically proven capacity of small businesses to come up with technological innovations that break new ground, produce commercial opportunities, and create jobs."

MERRA shares these objectives and works for them through its small business support program, SBIR backup efforts, and a continuing commitment to help small businesses overcome obstacles to their successful implementation of high technology innovations.

Recommendations and Conclusions

Successful innovation by technology-based small businesses will mean more jobs and greater competitiveness for the U.S. economy. What the American aeronautical industry has accomplished in the international marketplace, others can also accomplish; and the SBIR Program is helping make it happen.

That's why I consider it essential to continue government support for small business innovation and R&D. This should be accomplished by extending the SBIR Program beyond its termination date in 1993, because SBIR benefits both small businesses and the government agencies concerned. SBIR reauthorization efforts are needed now to assure continuity of funding. The Federal government currently funds close to half of all R&D in the U.S., and over 40,000 high technology small businesses exist in the country to make certain that the portion of those funds invested through the SBIR Program is well and wisely spent with valuable innovations as dividends. When they are realistically supported, small business entrepreneurs generally are more than eager to innovate, develop new products or services, and expeditiously move ahead as far as they can profitably go. That's what the country needs to help restore economic momentum, recapture its technological leadership, and compete globally.

At MERRA, our conclusions, based on front-line involvement, are that the SBIR Program gives the Federal government an exceptional return for its money, provides vital assistance to innovative small businesses, carries ideas to the commercialization stage, and generally delivers excellent results. The SBIR Program works, and we don't want to lose it.

On a cold March day in 1933, Justice Oliver Wendell Holmes told President-elect Franklin Roosevelt, "Young man, you have a chance, but hurry." Today we're in a somewhat similar position with a fighting chance, but the need to hurry. A pragmatic economic agenda or flight plan for the final decade of the century should retain the SBIR Program as a critical ingredient, because small business eagerness and hustle are indispensable assets for a country with an urgent need to hurry.

Senator LEVIN. On the SBIR question, do you offhand know the current funding level of that program?

Mr. ANUSKIEWICZ. Yes, the total funding is about $500 million a year.

Senator LEVIN. And how many years have we had it?

Mr. ANUSKIEWICZ. It's been since 1982. And the total since then, if you remember, the program was kind of ramped, ramped up, starting at a low percentage, and I believe now it's about a point and a quarter percent of extramural research. There's been about $1.7 billion which has been funded nationally to small research and development companies, and that generally means under 500 people, and I guess I thought when we looked at how we were going to be competitive in Michigan that these were the kind of companies that maybe you might not even consider a small business, you know, several hundred people, and certainly KMS has done well in the State of Michigan, but naturally, many of the companies that have done well are these small really startup companies, not investors, but really companies that have something innovative that there's a real market for.

Senator LEVIN. These are grants?

Mr. ANUSKIEWICZ. These are contracts or grants. There are two phases, and this is based on a National Science Foundation Program that was started some years ago, and the rationale, I believe, and could be apocryphal, is that in the Government, if the Government—really, my counterparts on the technical side aren't really too trustful of small businesses, will start in two phases, give them a small amount of money to start with, $50,000 phase one, and if they do well with that you have a chance to get a $500,000 phase two or up to $500,000.

Senator LEVIN. These are all grants?

Mr. ANUSKIEWICZ. Contracts, for the most part, except for Human Health and Services.

Senator LEVIN. What does the Government get?

Mr. ANUSKIEWICZ. The Government, if I can generalize, the Government will get a solution to a problem. They will get a tank tread for a tank or they will get something that's in the public interest, an aid, diagnostic tool. So essentially what——

Senator LEVIN. It will help to produce something that's needed, but they don't get any material, they don't get their money back, and they don't get a product or they don't get a certain number of tank treads?

Mr. ANUSKIEWICZ. No, sir, this is research and development, and say the department, if the research is carried out, might then be able to purchase this tank tread. Again, it's intended, and I understand this, that if I'm a small business and I go to TACOM or Wright Patterson, you know, there's a line of me out the door. This gives an opportunity. The Defense Department essentially issues a solicitation that looks like the Detroit phone book and it says, "Here's our research needs, you apply on January—this year it's January 5, and we'll let you know within 6 months whether you're getting an award or we'll let you know why not." Which, again, with Michigan, as you're better aware than I, the inexperience in this area, that that can kind of be a first step in letting companies then improve and do better or, on the other hand, as appropriate, finding out they really can't do it.

But it gets away from my friend this morning who sent something in and we joked that maybe in his lifetime he will get a response, and that's not intended to be a knock, that's just the way things are. We are not going to change that.

Senator LEVIN. Are the applications for that funding all funneled through MERRA or can they go directly to an agency?

Mr. ANUSKIEWICZ. No, they go directly to an agency.

Senator LEVIN. Are any of them funneled through you?

Mr. ANUSKIEWICZ. Our role in this was support from the Small Business Administration and from the Strategic Fund to help make companies good competitors in this program in all sorts of ways.

Senator LEVIN. To help point companies to this program, help them fill out their applications?

Mr. ANUSKIEWICZ. Yes, challenge them across the board, challenge them technically, which is something we're doing more and more by screening top technical people. Do a beautiful proposal, but if it's not good enough it's still not going.

Senator LEVIN. Do you have any idea how many applications have been filed by Michigan firms and how many have been awarded since 1982?

Mr. ANUSKIEWICZ. Generally, countrywide, and Michigan seems to fit the mold, is that the phase one is very competitive; phase two, if you do the work, you're in pretty good shape. One in 10 companies gets a phase one award. My view, which others don't agree with for obvious reasons, is that most good proposals get awards, and so it's our job to at MERRA and with lots of people's help to make good proposals.

Senator LEVIN. So if other States get a lot more money than we do it's because proportionately they file a lot more applications. You said there is a pattern we've got of 1 in 10. Was California getting 1 in 10?

Mr. ANUSKIEWICZ. Yes, sir, but my view of why my organization exists to some degree, or particularly works in this area, is that Michigan traditionally has not participated very much in Federal work. You don't leave a motor company and start doing research for the Federal Government. In Boston you would leave Wang or Digital and/or Silicon Valley.

Senator LEVIN. Is the percentage of applications granted for California a larger percentage or just more applications?

Mr. ANUSKIEWICZ. Just more applications, yes. It's more a way of life, and that's what we're trying to do here and with people's help in the room, I see Tom Keenan in the back, from Teledyne, a special person; Free, from RTI. Many people are working on that issue.

Senator LEVIN. Ms. Reesman, do the firms apply directly to the Upgrade Program?

Ms. REESMAN. Generally, yes, they apply themselves. They often work with organizations such as the one that C.J. heads locally. In some instances, with the assistance of organizations like the Michigan Modernization Service or the Department of Commerce, but the majority of them apply directly by themselves.

Senator LEVIN. And what's the average grant?

Ms. Reesman. About $15,000.

Senator Levin. You said that it's grown to $16 million?

Ms. Reesman. The total State investment in employer specific training, and that includes things that have to do with site location decisions as well as expansions and current employees is $16 million.

Senator Levin. You say that's obligated in the first few days or weeks?

Ms. Reesman. Some of it's obligated even further ahead than that.

Senator Levin. How much could you use, spend?

Ms. Reesman. Quite a bit more.

Senator Levin. Five times, 10 times? .

Ms. Reesman. I hear C.J. laughing. Certainly would be an ample amount. One of the things, at this point we don't even push it a great deal because we don't have enough money and we're afraid of companies, frankly, getting angry about that. My guess is if we had more money and we did more pushing it we could certainly take care of two, three, four, five times as much money. One important piece, though, is that it's not just a grant to a company that's of assistance to a company. The technical assistance that gets provided up front to help a company, particularly smaller companies, to make sure that they provide the right type of training is very important. Most small companies don't have that in-house expertise.

Senator Levin. What current Federal program comes the closest to providing support for the kind of program that you're in, providing upgraded skills for advanced technologies in existing jobs?

Ms. Reesman. The closest thing that is possible is that States are allowed, under Carl Perkins, to use a portion of money for what are often termed Quick Start programs that have educational institutions providing training for business and industries. It has to be training provided by educational institutions.

Senator Levin. Quick Start, what's that?

Ms. Reesman. That's just the name of the program that's often used in many States, but it's a subset of Carl Perkins. It isn't officially funded, but States are allowed to earmark a portions of funds to be used for——

Senator Levin. For existing jobs? .

Ms. Reesman [continuing]. For existing jobs.

Senator Levin. And is it limited, the proportion of the Perkins funds that can be used for that purpose?

Ms. Reesman. I don't know. In this State it's about $1½ million.

Senator Levin. Does some of that money go to you?

Ms. Reesman. It goes to the Department of Education and we work with them very closely.

Senator Levin. So some of your $16 million from the Perkins money comes to this State?

Ms. Reesman. No, the $16 million is all State money. The Perkins money is on top of that.

Senator Levin. Where is that spent in this State?

Ms. Reesman. It is all spent, it goes through educational institutions so, for example, a company in this area would approach, for example, Grand Rapids Junior College, who would then apply on their behalf to the Department of Education for a training program tailored for that company.

Senator LEVIN. And that's basically the same thing you're doing?

Ms. REESMAN. No, in our programs they don't have to work through an educational institution. The training doesn't have to be delivered or provided by an educational institution. It doesn't have to have an effect on the curriculum of the educational institution. The company can come straight to us. They can use any type of vendor that they wish to do the training.

Senator LEVIN. Are there vendors other than institutions?

Ms. REESMAN. Yes.

Senator LEVIN. Educational institutions?

Ms. REESMAN. Oh, yes.

Senator LEVIN. What percentage of your vendors are other than educational institutions?

Ms. REESMAN. Sixty percent.

Senator LEVIN. Give me an example of those vendors.

Ms. REESMAN. Equipment vendors.

Senator LEVIN. Who do the training?

Ms. REESMAN. Who do the training. That would be specifically for a piece of technology that they have sold to a company, and that's a very, very common form of training. Private training organizations also exist, both for profit and nonprofit.

Senator LEVIN. It's very interesting.

We will keep this hearing record open until January 28, and may be in touch with our witnesses for additional information. We may have a hearing in Washington where we would involve the SBA and the Department of Education, possibly, in furtherance of some of the issues which have been raised here.

What we're seeing is rather typical in this country, which is that States and communities are kind of national test tubes. We have a real problem and it's a catchup problem because we're behind in terms of our technological education. What we see is a vacuum, but this void is being filled partially by the States. Hopefully, the Federal Government is going to help our States and local communities do what they are finding they have to do to survive. This has been a very useful and very interesting hearing for me.

I hope to help the Federal Government take a more active role in this, not just on your end of things but otherwise, even though I don't exclude that by any stretch of the imagination, Todd. My office is, of course, accessible to all of you, both here in Grand Rapids and in Washington, and we'll keep in close touch as this progresses.

We are right on the cutting edge of what we've got to be doing in this country to be competitive, and hopefully now we're going to have some more resources to throw into education so we can be competitive as some of our defense expenditures taper off.

We thank you all. We thank our reporter who's gone without a break here. We stand adjourned.

[Whereupon, at 1:45 p.m. the Subcommittee was adjourned.]

APPENDIX

STATEMENT

OF

SUSAN ENGELEITER

ADMINISTRATOR, U.S. SMALL BUSINESS ADMINISTRATION

BEFORE THE SENATE SUBCOMMITTEE ON

INNOVATION, TECHNOLOGY AND PRODUCTIVITY

DECEMBER 19, 1989

If the United States is to maintain and expand its competitive position in domestic and global markets, this nation must stand first in the production of innovative, cost-effective quality goods that satisfy consumer demand. The small business sector of our economy is prepared to meet this challenge. Small businesses have been and will continue to be major innovators of the high-technology driven means of production that keep us at the forefront of economic advancement. We at the Small Business Administration are supporting this progress.

I am pleased to report that the agency's highly successful Small Business Innovation Research (SBIR) program is a strong means for this support. Since the inception of this program in 1982, the 11 participating agencies have made more than 12 thousand high technology awards amounting to an estimated $1.3 billion in funding. That funding has underwritten research on product innovation of immense value.

I would like to provide two excellent examples of the type of innovative technology being developed by small businesses. BioQuant, Inc., of Ann Arbor, Michigan, a biotechnology firm, is perfecting a procedure that will radically reduce the time needed for various medical tests. Today's drug testing procedures, for example, often involve delays because specimens must be sent to laboratories for analysis. BioQuant, employing SBIR awards from the National Institutes of Health, has designed instruments called biosensors which provide a rapid, low-cost disposable and quantitative diagnostic tool used at the site of the patient. The products provide quick information on biologically active molecules in test samples. These products are ideal for critical care hospital wards, doctors' offices, homes and field testing units.

The company has also been granted a patent for an oral fluid collecting device, which allows for fluid purification when passed through an osmotic membrane. BioQuant sees an excellent market for the device because of its capacity to facilitate rapid measurements of drug substances to determine abuse.

The second example of innovative technology development involves another firm located in Ann Arbor. A $50,000 Phase I SBIR award from the Navy in 1985, followed by a $500,000 Phase II award in 1987, allowed KMS Industries--through its KMS Fusion subsidiary--to develop and then successfully market a "ruggedized" microcomputer. This product is capable of withstanding adverse computing conditions experienced aboard ships and airplanes, and other extreme environments.

KMS Industries' IBM-PC AT compatible microcomputers are portable and can be rack-mounted and operated despite shock, vibration, moisture, dust and extreme ranges of temperature and humidity. The computers meet Defense Department critical specifications and requirements. The computers are off-the-shelf items and represent the type of commercial product that DoD buys whenever possible, at up to one-tenth the cost of fully-militarized systems.

In 1988, KMS shipped more than 130 microcomputers, with a sales value of $2 million, to the military, to civilian prime contractors and to system integrators as well as to other commercial enterprises that employ "ruggedized" computers. The 1988 shipments were double the company's original expectations.

In referring to its microcomputer contract with KMS, DOD has described the company's work as "the most successful SBIR program, based on the transition from development to a full production program."

To assist these evolving technologies and firms, we at the SBA have a variety of support programs. These include our Commercialization Matching System, our traditional loan programs, our national network of Small Business Development Centers, our International Trade Division and our Procurement Assistance Programs.

SBA is also equipped and ready to assist development in every facet of the commercialization process.

U.S. SMALL BUSINESS ADMINISTRATION
WASHINGTON, D.C. 20416

JAN 29 1990

Honorable Carl Levin
United States Senate
Washington, DC 20510

Dear Senator Levin:

Thank you for your letter of January 5, 1990 requesting further information on testimony provided to you for your December 18, 1990 hearing. This hearing focused on the labor and capital problems of small firms implementing new and high technologies in their businesses. Our testimony was limited to those areas within our legislative mandate and within our areas of expertise.

In your letter you requested information on three questions:

1. How does the SBA assist small businesses, in Michigan and elsewhere, seeking to use new and high technology?

The SBA has several programs that will assist small businesses seeking to use new and high technology. For example, our Office of Business Development offers a wide range of small business training and counseling assistance. This assistance, delivered through SBA field offices and resources such as the Small Business Development Centers, the Service Corps of Retired Executives and the Small Business Institute, includes in addition to the usual spectrum of business management advice, referrals to local organizations active in the process of providing information on the continuing process of developing and adapting to the new technologies. These efforts include providing information on technology transfer information sources, information on state and local employee development sources, and assistance in finding technical advice through universities and other sources.

SBA also administers programs that can provide needed capital to qualified firms that need to modernize equipment or processes to take advantage of the many new technological advances in all types of business operations. Our business loan programs and the Small Business Investment Company program offer a spectrum of financing assistance for small firms seeking to develop or use new or high technologies in their business operations. The Small Business Innovation Research program offers competitive opportunities for small firms to participate in Federal research and development work. Their R&D work in this program can provide a working knowledge of state of the art technological concepts which can help them develop and use the innovations developed under this program in their internal operations.

2. How does the SBA assist small businesses in obtaining education and training programs for their employees who use new and high technology?

SBA offers a wide variety of management assistance training and education programs through its network of field offices and resources such as universities, Service Corps of Retired Executives and agreements with Junior and Community Colleges. Included in these courses is information on the many personnel considerations facing small business management, including hiring and maintaining a capable work force. In addition to our own training efforts our offices and resources will refer business managers to other organizations and institutions that provide specific technology training opportunities.

3. Also, please include a comprehensive listing of Federal programs, and their level and type of funding, available to small businesses for the educating and training of employees to use new and high technology.

Assistance to businesses in hiring and training work forces are normally provided through state and local organizations and institutions. Throughout the country these groups are numerous and diverse. To be effective in providing a specific small business with assistance on a work force problem we expect our field office personnel and SBA resources to develop contacts with these organizations in their local areas. Many of these state and local organizations are funded by Federal programs, particularly those of the Department of Labor and the Department of Education. In that most of these Programs are delivered by Federal agencies to state organizations and not directly to specific large and small businesses, and that most of the Federal assistance is not specifically categorized by size of the business recipient, we do not maintain comprehensive national listings.

We appreciate your interest in the many problems small business faces with the accelerating rate of change in technology. While clearly these changes challenge the abilities of small business management, they also provide expanded opportunities for today's entrepreneur to expand into new areas of potential reward. Throughout our history it has often been the entrepreneur that has provided the new products and services so important to our economic competitiveness. The programs described here are clearly helpful in providing the assistance necessary for their continuing success in high technology.

Sincerely,

Susan Engeleiter

Susan Engeleiter
Administrator